G-3

# MX880215A
# GSM Measurement Software
# (For MT8802A)
# Operation Manual

Third Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measurement Solutions
ANRITSU CORPORATION

MAR.
2001

Document No.: M-W1501AE-3.0

# Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
(Some or all of the following symbols may not used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.)

## Symbols used in manual

**DANGER** ⚠ This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

**WARNING** ⚠ This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

**CAUTION** ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

## Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MX880215A GSM Measurement Software
(For MT8802A)
Operation Manual

11 September 1998 (First Edition)
13 March 2001 (Third Edition)

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# For Safety

## WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

**Repair**

**WARNING ⚠**

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

**Falling Over**

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

## WARNING ⚠

**Battery fluid**

5. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.

   This fluid is poisonous.

   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

**LCD**

6. This instrument uses a Liquid Crystal Display (LCD);
   DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

# For Safety

## CAUTION ⚠

**Changing Fuse**

**CAUTION ⚠**

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T□□□A indicates a time-lag fuse.
   □□□A or F□□□A indicates a ordinary melt type fuse.
   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

**Cleaning**

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

**Heavy weight**

| ⚠ CAUTION |
| --- |
| >18 kg |
| Heavy weight |

3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

**Check Terminal**

4. Never input a signal of more than the specified voltage between the measured terminal and ground. Input of an excessive signal may damage the equipment.

5. Do not take out the floppy disk if LED lamp of the floppy disk drive is on. If it is taken out, the contents of the storage medium will be damaged, resulting in floppy disk drive failure.

## CAUTION ⚠

**Memory Back-up Battery**

6. The power for memory back-up of the MT8802A is supplied by a poly-carbomonofluoride lithium battery. this battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.
At the end of it's life, the battery should be recycled or disposed properly.
*Note: The Battery life is about 7 years. Early battery replacement is recommended.*

**Storage Medium**

7. The MT8802A stores data and programs using a floppy disk (FD), memory card (MC), and backed-up memories.
Data and programs may be lost due to improper use or failure.
Anritsu therefore recommends that you back up the memory.
ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points. Do not remove the floppy disk from the equipment being accessed.

(FD)
- Do not touch the FD directly or by using any object.
- Do not place the equipment where dirty and dusty.
- Isolate the FD and memory card from static electricity.
- Avoid to placing the FD in direct sunlight or near heating sources.
- Store under temperature of 40˚ to 54˚C, humidity of 8 to 90% (No condensation).

(Memory card)
- Isolate the memory card from static electricity.

(Backed-up memory)
- Isolate the memory from ststic electricity.

**Disposing of The Product**

8. The MT8802A uses chemical compound semiconductor including arsenic.
At the end of its life, the MT8802A should be recycled or disposed properly according to the local disposal regulations.

# Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory and the Communication Research laboratory, and was found to meet the published specifications.

# Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault.

When this software alone is purchased, Anritsu will repair or exchange this software free-of-charge at the company's own discretion if it provides defective within 1 year after purchase when used as described in the operation manual.

This warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

# Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

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Please read this Software License Agreement before using the accompanying software program (hereafter this software).

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If you do not agree to these terms, return the unopened software package to Anritsu Corporation (hereafter Anritsu).

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## Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the data acquisition requires a long time at the BER measurement, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, the standby function of this equipment must be modified.

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# MX880215A
# GSM Measurement Software
# (For MT8802A)
# Operation Manual
# (Panel Operation)

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# GENERAL

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## 1.1 General

The MT8802A Radio Communication Analyzer is a measuring-instrument platform that consists of the hardware components necessary for testing digital mobile telecommunication terminals. Using the MT8802A along with the available measurement software allows you to evaluate the performance of mobile telecommunication equipment with efficiency.

By using measurement software MX880215A, you can use the MT8802A as an integrated measuring instrument (hereafter called this analyzer) that can evaluate the functions and performance of the mobile telecommunication equipment conforming to GSM (Global System for Mobile Telecommunication: European standard for digital portable telephones).

This analyzer is provided with measurement functions such as mobile-station (MS) control, transmission measurement, error rate (reception) measurement, and sequence monitor. Only this analyzer is adequate to test the GSM mobile stations for transmission and reception.

Measurement functions offered by this analyzer are as follows:

- Mobile station control: A mobile station can be placed in a GSM-specified measurement state by performing call processing. Normally, the transmission and reception are measured with a mobile station set in this state.
- Transmission measurement: GSM-specified RF-modulated signals (e.g., carrier frequency, signal level, and modulation accuracy) can be measured.
- Reception measurement: A BER (Bit Error Rate) can be measured by demodulating the RF-modulated signal from a mobile station, allowing the receiving sensitivity of the mobile station to be measured based on the measured BER.
- Sequence monitoring: A performance test can be conducted for origination, termination, disconnection, hand-over, and voice echo-back.

This analyzer is equipped with a high-speed digital signal processing technology, allowing you to carry out transmission and reception measurements quickly and with high accuracy.

## 1.2 Manual Composition

This manual is made up of the following sections.

Section 1 General
Describes the introduction, composition, function specifications and performance of this instrument.

Section 2 Preparations before Use
Explains various work to be performed before using this instrument.

Section 3 Panel Layout and Overview of Operation
Explains the basic items for operating this equipment.

Section 4 Operation
Explains basic operation and how to operate for each measurement item.

Section 5 Performance Test
Explains the performance test method for this instrument.

Section 6 Calibration
Describes calibration items and methods for the periodical calibration of this equipment.

Section 7 Storage and Transportation
Describes how to store and transport this equipment.

Appendix A Screens and Function Key Transition Diagrams

## 1.3 Equipment Configuration

This paragraph describes the configuration of the MX880215A standard accessories.

### 1.3.1 Standard configuration

The table below shows the configuration of the MX880215A with the standard accessories.

Table 1-1 MX880215A Standard Accessories

| Item | Order No. | Name | Qty | Remarks |
|---|---|---|---|---|
| Software | MX880215A | GSM Measurement Software | 1 | |
| Accessories | W1501AE | Operation manual | 1 | For GSM system |

The table below shows the configuration of the MT8802A with the standard accessories.

Table 1-2 MT8802A Standard Accessories

| Item | Order No. | Name | Qty | Remarks |
|---|---|---|---|---|
| Main instrument | MT8802A | Radio communication analyzer | 1 | |
| Accessories | J0576B | Coaxial cord | 1 | N-P·5D-2W·N-P, 1m |
| | J0768 | Coaxial adapter | 2 | N-J·TNC-P |
| | J0017F | Power cord | 1 | 2.6m |
| | J0266 | Adapter | 1 | 3 poles to 2 poles plug conversion adapter |
| | F0014 | Fuse | 2 | 6.3A for 100V/200V system |

### 1.3.2 Option

The table below shows the MT8802A options.

These are sold separately.

Table 1-3 Options

| Option No. | Name |
|---|---|
| 07 | Spectrum analyzer |

### 1.3.3 Software

The table below shows the MT8802A softwares.

Table 1-4 Softwares

| Model/Order No. | Name | Remarks |
|---|---|---|
| MX880201A | CDMA Measurement Software | Sequence Monitor provided. |
| MX880213A | IS-136A Measurement Software | Sequence Monitor provided. |
| MX880215A | GSM Measurement Software | Sequence Monitor provided. |

## 1.4 Optional Accessories and Peripherals

The following table shows the optional accessories and peripherals for the MT8802A which are all sold separately.

### Table 1-5 Optional Accessories and Peripherals

<Optional accessories>

| Model*/Order No. | Name* | Remarks |
|---|---|---|
| J0127C | Coaxial cord | BNC-P•RG-58A/U•BNC-P, 0.5m |
| J0769 | Coaxial adapter | BNC-J•TNC-P |
| J0040 | Coaxial adapter | N-P•BNC-J |
| J0007 | GPIB connection cable | 408JE-101, 1m |
| J0008 | GPIB connection cable | 408JE-102, 2m |
| J0742A | RS-232C cable | 1m, D-sub 25pins, for PC-9800 Series personal computer of NEC Corp. |
| J0743A | RS-232C cable | 1m, D-sub 9pins, for IBM PC/AT personal computer |
| MN1607A | Coaxial switch | DC to 3GHz, 50Ω, externally controllable |
| MA1612A | 4-Port junction pad | 5 to 3000MHz |
| J0395 | Attenuator for high power | 30dB, 30W, DC to 9GHz |
| B0329D | Protective cover | |
| B0331D | Front handle kit | 2 pcs/set |
| B0332 | Coupling plate | 4 pcs/set |
| B0333D | Rack mounting kit | |
| B0334D | Carrying case | With casters and protective cover |

* Please specify the model/order number, name, and quantity when ordering.

<Peripherals and applicable units>

| Model*/Order No.* | Name* |
|---|---|
| MS8606A | Digital mobile radio transmitter tester |
| MS2602A | Spectrum analyzer |
| MG3670B | Digital modulation signal generator |

* Please specify the model/order number, name, and quantity when ordering.

## 1.5 Specifications

The MT8802A specifications are listed in Tables 1-6 to 1-7 below.

### Table 1-6 MT8802A Specifications

| | | | |
|---|---|---|---|
| General | Frequency range | | 300 kHz to 3 GHz |
| | Maximum input level | | +40 dBm(10 W) (MAIN connector)<br>+20 dBm (100 mW) (auxiliary input connector) |
| | Input/output connector | MAIN I/O connector | N-type connector<br>Impedance 50 Ω, VSWR≤1.2 (Frequency≤2.2 GHz)<br>VSWR≤1.3 (Frequency>2.2 GHz) |
| | | Auxiliary input connector,<br>Auxiliary output connector | TNC connector |
| | Reference oscillator | Frequency | 10 MHz |
| | | Starting characteristic | ≤5 x $10^{-8}$/day<br>After 10 minutes of warm-up, refered to frequency after 24 hours of warm-up |
| | | Aging rate | ≤2 x $10^{-8}$/day<br>≤1 x $10^{-7}$/year<br>Refered to frequency after 24 hours of warm-up |
| | | Temperature characteristic | 5 x $10^{-8}$ (0 to 50°C) Refered to frequency at 25°C |
| | | External standard input | 10 MHz or 13 MHz(within ±1 ppm), Input level : 2 to 5 Vp-p |
| Others | Display | | Color TFT LCD display<br>Size: 7.8 inches<br>Number of dots: 640 x 480 |
| | Hard copy | | Enables data hard copy on the display through a parallel interface.<br>(Only for the EPSON VP Series and other close kind models) |
| | External control | GPIB | Function: This equipment is specified as a device, can be controlled from external controller. (excluding power switch and FD ejection key)<br>No controller function<br>Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2 |
| | | Parallel | Function: Conforms to the Centronics. Outputs printing data to a printer.<br>Data line exclusive for output: 8<br>Control line: 4 (BUSY, $\overline{\text{DTSB}}$, $\overline{\text{ERROR}}$, PE)<br>Connectors: D-sub 25 pins, Female (Equivalent to the connector of IBM-PC/AT built-in printer) |
| | | RS-232C | Controlled from an external controller (except for the power switch)<br>Baud rate: 1200, 2400, 4800, or 9600 bps |
| Dimensions<br>Mass<br>Power supply | Dimensions | | 221.5 mm (H) X 426 mm (W) X 451 mm (D) |
| | Mass | | ≤27 kg (When the optional accessories are not equiped) |
| | Power supply | | 100 to 120 V, 200 to 240 V 47.5 to 63 Hz, ≤300 VA Automatic voltage switch system |
| | Operating temperature range | | 0 to 50°C |

# Table 1-7 MX880215A: GSM Measurement Software Specifications

| | | | | |
|---|---|---|---|---|
| Transmission measurement | Modulation/ frequency measurement | Frequency range | | 10 MHz to 2.2 GHz |
| | | Input level range | | –10 to +40 dBm (Average power within burst) : MAIN connector<br>–30 to +15 dBm (Average power within burst) : AUX Input connector |
| | | Carrier frequency | | Accuracy: ±(accuracy of the reference frequency +10 Hz) |
| | | Residual phase error | | Accuracy: ≤0.5 degrees rms, ≤2 degrees peak |
| | | Waveform display | | Eye Pattern display, Phase Error vs Bit No. display, Magnitude Error vs Bit No. display, IQ Diagram display |
| | Amplitude measurement | Frequency range | | 10 MHz to 2.2 GHz |
| | | Input level range<br>Transmission power | | +10 to +40 dBm (Average power within burst): MAIN connector<br>Accuracy: ±10% (MAIN connector)<br>(after calibration by using built-in power meter) |
| | | Carrier-off power | Normal mode | Measurement range: ≥55 dB (compared with burst average power) |
| | | | Wide dynamic range mode | Measurement range: ≥80 dB (compared with 1 W of burst average power)<br>Measurment limit is decided by average noise level (≤–50 dBm, 100 MHz to 2.1 GHz). |
| | | Rise/fall characteristic | | Displays rising/falling edges while synchronizing to modulation data of signal to be measured. Standard line display possible. Raising/falling time measurement (measured by 100 MHz bandwidth) |
| | Output RF spectrum measurement | Frequency range | | 100 MHz to 2.2 GHz |
| | | Input level range | | +10 to +40 dBm (Average power within burst): MAIN connector |
| | | Modulation portion measurement range | | ≥50 dB (≥200 kHz offset)<br>≥66 dB (≥250 kHz offset) |
| | | Transient portion measurement range | | ≥57 dB (≥400 kHz offset) |
| | | Measurement point | | ±100 kHz, ±200 kHz, ±250 kHz, ±400 kHz, ±600 kHz, ±800 kHz, ±1000 kHz, ±1200 kHz, ±1400 kHz, ±1600 kHz, ±1800 kHz, ±2000 kHz |
| | All measurement items | Frequency range | | Same as each the measurement item. |
| | | Input level range | | Same as each the measurement item. |
| | | Measurement item | | Transmission frequency<br>Transmission frequency error<br>Phase error(rms,peak)<br>Transmission power<br>Carrier off power<br>Carrier on/off ratio<br>Pass/Fail judgement for response time specification of transmission output<br>Burst position<br>Transmission power vs time<br>Reception level report from mobile station (only at DUT Control : Call Proc)<br>Reception quality report from mobile station (only at DUT Control : Call Proc)<br>Transmission power report from mobile station (only at DUT Control : Call Proc)<br>Timing advance report from mobile station (only at DUT Control : Call Proc)<br>Output spectrum |
| | | Measurement time | | When DUT Control = None<br>≤2.0 s (When amplitude measurement at normal mode)<br>≤2.5 s (When amplitude measurement at wide dynamic range mode)<br>When DUT Control = Call Proc<br>≤3.0 s (When amplitude measurement at normal mode)<br>≤3.5 s (When amplitude measurement at wide dynamic range mode)<br>(The time from the start to completion (SRQ signal generation) of measurement by GPIB control) |

## Table 1-7 MX880215A: GSM Measurement Software Specifications

(Cont.)

| | | | |
|---|---|---|---|
| Reception measurement | Signal generator | Frequency range | 10 MHz to 3 GHz |
| | | Level range | –133 to –13 dBm (MAIN connector)<br>–133 to –7 dBm (Auxiliary Output connector) |
| | | Modulation system | GMSK, BbT=0.3 (Gaussian filter) |
| | | Phase error | ≤2 degrees rms |
| | | Burst repeat period | 4.615ms<br>Note that one burst is outputted in one frame. |
| | | Modulation data | Continuous waveform output:<br>• PN9 and PN15 pseudo-random patterns and arbitrary 4-bit data repetitive patterns<br>Burst waveform output:<br>• Communication-channel 10 test patterns selectable |
| | Error rate measurement | Function | FER/CIb/CII error rate measurement is done by receiving RF modulated signal for error rate measurement conformed to GSM specification. |
| | | Measurement pattern | 10 test patterns selectable |
| | | Number of measurement samples | FER : 1 to 99 999 999<br>CIb : 1 to 99 999 999<br>CII : 1 to 99 999 999 |
| Call Processing | Pass/Fail judgement of registration/origination/termination/communication/hand-over/disc from network/disc from mobile station | | |

# SECTION 2
# PREPARATIONS BEFORE USE

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## 2.1 Installation Site and Environmental Conditions

The MT8802A Radio Communication Analyzer operates normally at temperatures from 0° to 50°C. However, for the best performance, the following locations should be avoided.

- Where there is severe vibration
- Where the humidity is high
- Where the equipment will be exposed to direct sunlight
- Where the equipment will be exposed to active gases

To insure long-term trouble-free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

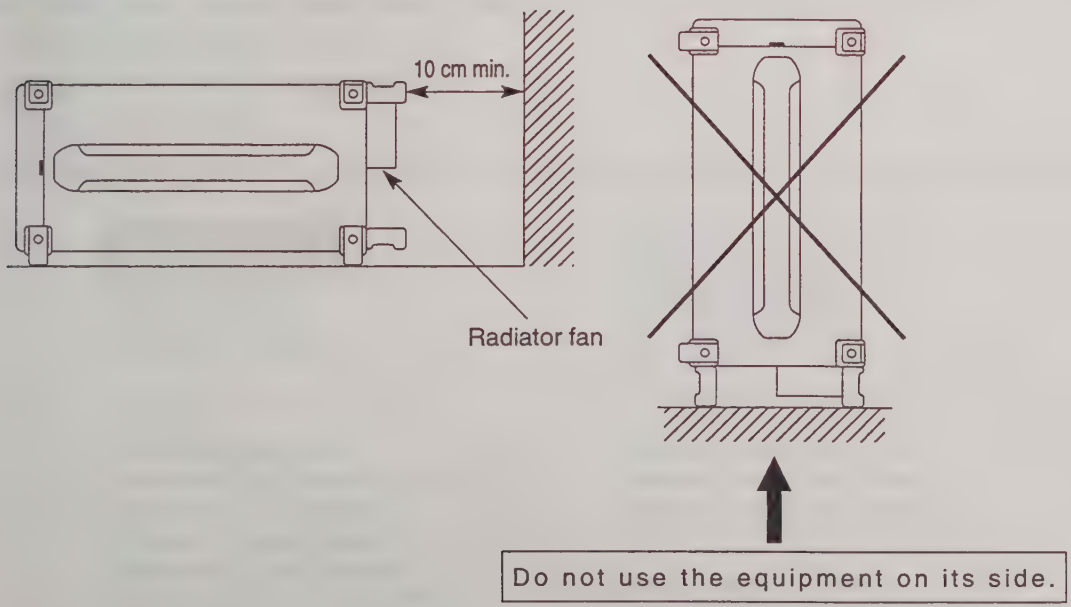
**CAUTION ⚠**

- Prevention of failure due to condensation

If the MT8802A is used at normal temperatures after it has been used or stored for a long time at low temperature, there is a risk of short-circuiting caused by condensation.
To prevent this risk, do not turn the power on until the MT8802A has been allowed to dry out sufficiently.

Fan clearance:

To suppress any internal temperature increase, the MT8802A has a fan on the rear panel as shown in the diagram below. Leave a gap of at least 10 cm between the rear panel and the wall, nearby equipment or obstructions so that fan ventilation is not blocked.



## 2.2 Safety Measures

This paragraph explains the safety procedures which should be followed under all circumstances to counter the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

### 2.2.1 Safety measures for power supply

WARNING ⚠

| | |
|---|---|
| Before power-on: | • Protective grounding<br>The MT8802A must be connected to ground. If the power is turned on without taking this countermeasure, there is a risk of receiving an accidental electric shock.<br>• Power supply voltage<br>In addition, it is essential to check the power supply voltage. If an abnormal voltage that exceeds the specified value is input, there is an accidental risk of damage to the MT8802A and fire. |
| During power on: | • To maintain the MT8802A, sometimes it is necessary to make internal checks and adjustments with the top, bottom or side covers removed while power is supplied. Very-high, dangerous voltages are used in the MT8802A; if insufficient care is taken, there is a risk of an accidental electric shock being received or of damage to the equipment. To maintain the MT8802A, request service by service personnel who has received the required training. |

In the following, special notes on safety procedures are explained for sections other than Section 2. To prevent accidents, read this section together with the related sections before beginning operation.

### 2.2.2 Maximum power to connector

The allowable maximum power to the MT8802A connectors are as follows.

| Connector | Allowable maximum power |
|---|---|
| Main Input/Output | 10 W (40 dBm) |
| AUX Input | 100 mW (20 dBm) |
| AUX Output | Exclusive output connector, 0.5 mW (-3 dBm) |
| AF Input | 30 Vrms |
| AF Output | Dedicated output connector, 5 Vrms (output impedance : 600 Ω), 0.5 Vrms (output impedance : 50 Ω) |
| DUT Interface | TTL level |
| Reference Input | 2 to 5 Vp-p |
| 10MHz Buffered Output | Dedicated output connector, TTL level |
| Detector Output | Dedicated output connector, TTL level |
| BER Input connectors | TTL level |
| Ext Trig Input | TTL level |
| Ext Trig Output | Dedicated output connector, TTL level |
| Ext FM Input | ±10 Vp-p |
| Demod Output | Dedicated output connector, ±8 Vp-p |

**CAUTION ⚠**

• Excessive power protection
Never apply power more than the allowable maximum power. Also, do not input external signal to the output connector.

## 2.3 Preparations before Power-on

The MT8802A operates normally when connected to 85 to 135 Vac, 47.5 to 63 Hz, or 170 to 250 Vac, 47.5 to 63 Hz AC power supply via the power inlet.

To prevent the following problems, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock
- Damage caused by abnormal voltage
- Ground current problems

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the MT8802A.

**WARNING ⚠**
NO OPERATOR SERVICE-ABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED PERSONNEL.

WARNING
Disassembly, adjustment, maintenance, or other access inside this instrument by unqualified personnel should be avoided. Maintenance of this instrument should be performed only by Anritsu trained service personnel who are familiar with the risks involved of fire and electric shock.

**CAUTION ⚠**
FOR CONTINUED FIRE PROTECTION REPLACE ONLY WITH SPECIFIED TYPE AND RATED FUSE.

CAUTION
Replace only with fuses of the specified type and rating. The use of improper fuses may cause fire.

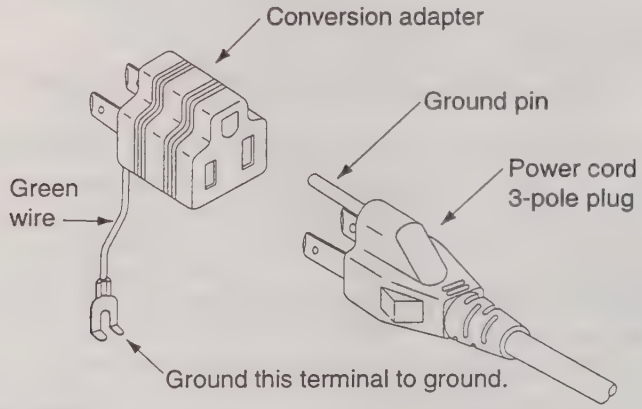
## 2.3.1 Protective grounding

### (1) Grounding with 3-pole power outlet

The power supply polarity of the 3-pole (grounded, 2-pole type) matches that of the 3-core power cord plug. Therefore, the MT8802A is connected to ground potential when the power cord is connected to the plug. As a result, it is not necessary to connect the FG terminal to ground.

### (2) Grounding with conversion adapter

If a 3-pole power socket is not provided, use the 3-pole to 2-pole conversion adapter as shown in the figure below. Connect the green wire protruding from the 3 to 2 conversion adapter to ground.

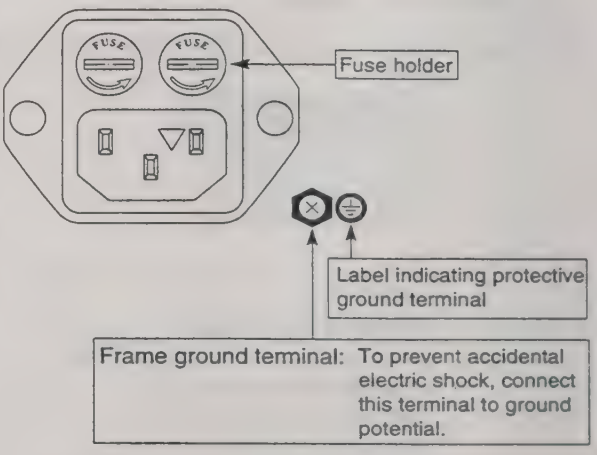



### (3) Grounding with frame ground (FG) terminal

If a 3-pole ac power supply outlet is not available and the green wire cannot be grounded, the protective frame ground (FG) terminal on the rear panel must be connected directly to ground potential.

**WARNING ⚠**

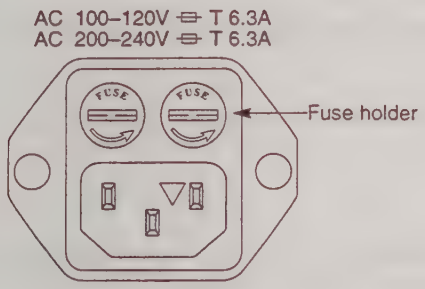
• Prevention of danger using protective ground terminal
If power is supplied without protective grounding, there is a risk of accidental electric shock. If a 3-pole power supply outlet is not available and the green wire cannot be grounded, the protective frame-ground (FG) terminal on the rear panel must be connected to ground potential before power is supplied to the MT8802A.


FUSE
FUSE
Fuse holder
Label indicating protective ground terminal
Frame ground terminal: To prevent accidental electric shock, connect this terminal to ground potential.

## 2.3.2 Replacing fuse

The MT8802A with standard accessories has two spare fuses (T6.3A250V). Use these fuses to replace the blown fuses. If the fuses must be replaced, locate and remedy the cause before replacing the blown fuses.

| Power supply system | Voltage range | Fuse rating plate | Fuse rating | Fuse name | Model/Order No. |
|---|---|---|---|---|---|
| 100 Vac | 100 – 120V | T6.3A | 6.3A, 250V | T6.3A 250V | F0014 |
| 200 Vac | 200 – 240V | T6.3A | | | |




### WARNING ⚠

- Prevention of electric shock

Before replacing the fuses, turn the power switch off and remove the power cord from the power outlet. If the fuses are replaced while power is being supplied, there is a serious risk of electric shock.

- Confirmation before turning the power on

After replacing fuses, the protective grounding mentioned above must be provided before turning the power on again, and the proper AC power supply voltage must be confirmed. If the AC power supply voltage is improper, there is a risk of the internal circuits of the MT8802A being damaged.

### CAUTION ⚠

- Check on replacing fuses

If the replacement fuses are not provided, obtain replacement fuses of the same rated voltage and current as the fuses in the fuse holders.

If the replacement fuses are not of the same type, they may not fit correctly, and failure will occur due to melting of the fuse.

When the rated voltage and current are over-sufficient, the fuses may not blow even if there is a risk of damage to the equipment by fire.

After performing the safety procedures, replace the fuses according to the following procedure.

| Step | Procedure |
|---|---|
| 1 | Turn off the power switches on the front and rear panels, then remove the power cord from the power supply outlet. |
| 2 | Use a screwdriver to turn the fuse holder cap shown in the figure counterclockwise. The cap and fuse are removed together as a unit from the AC inlet. |
| 3 | Remove the fuse from the fuse cap and replace it with a spare fuse. |
| 4 | Return the fuse cap with the fuse to the fuse holder, then fasten it by turning it clockwise with the screwdriver. |

* Contact the Anritsu service department for fuses by specifying the model name, order number, name, and quantity.

## 2.4 Installation

### 2.4.1 Rack mounting

The B0333D Rack Mounting Kit (sold separately, Table 1-3) is required to mount the MT8802A in a rack.
The installation method is included in the rack mount kit diagram.

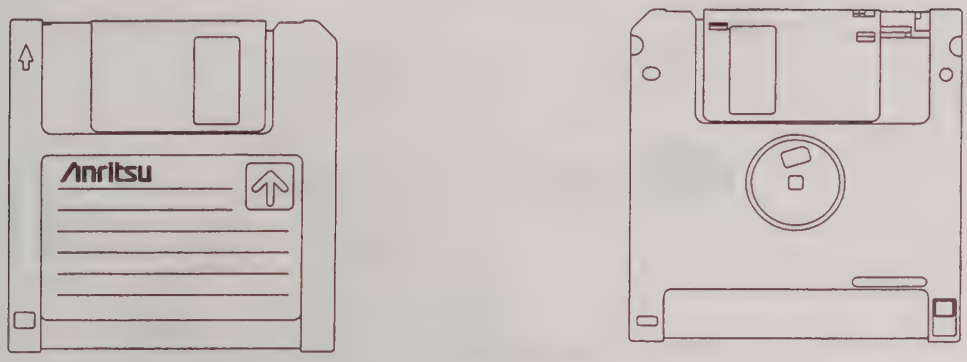
### 2.4.2 Stacking

When stacking several MT8802A's or stacking the MT8802A with equipment of the same width as the MT8802A, the B0332 Coupling Plate (sold separately, Table 1-3) are required.

## 2.5 Precautions for Handling Storage Media

### 2.5.1 Floppy disk

The following explains how to handle the floppy disk media of this instrument.




Front Rear

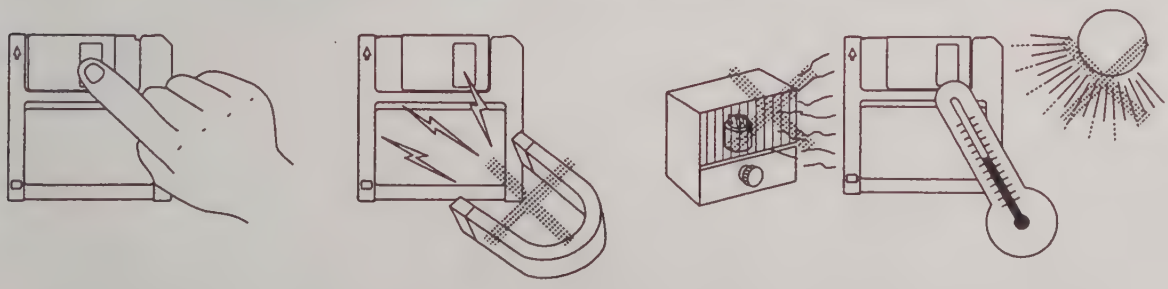
Fig. 2-1 3.5-inch Floppy Disk

(1) Precautions

The plastic case of the 3.5-inch floppy disk has a shutter to protect the disk inside. When the disk is inserted into the disk drive, the shutter opens to expose part of the disk. Do not touch the shutter.

The following care must be taken for handling the disk.

(a) When a floppy disk is inserted, and LED lamp on the disk drive lights, do not eject the disk. Otherwise, the memory contents may be damaged, resulting in disk drive failure.
(b) Do not directly touch the magnetic surface with your hand or any object.
(c) Do not expose the disk to dust.
(d) Do not place the disk near any magnetic objects.
(e) Do not place the disk in direct sunlight or near heater.
(f) Store the disk under a temperature range of 4° to 53°C, and humidity of 8 to 90% (no condensation).



(2) Write-protection tab

A write-protection tab is provided on the 3.5-inch floppy disk.

Sliding this tab downward in the arrow direction beforehand prevents accidental writing and deletion. (A write operation is disabled in this state.)

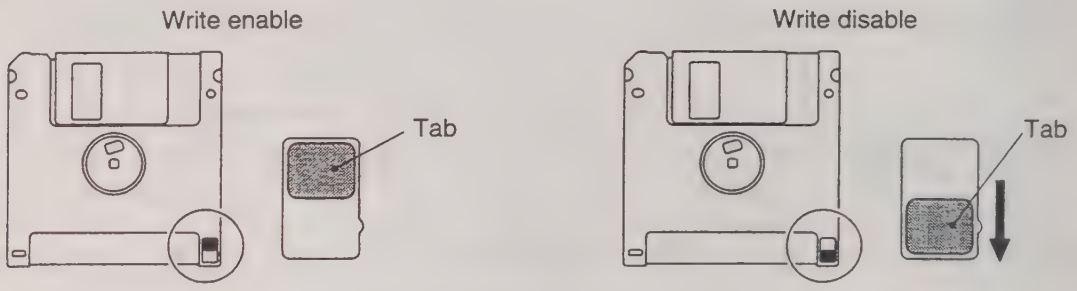



Fig. 2-2 Write-protection Tab for 3.5-inch Floppy Disk

(3) Inserting and ejecting the floppy disk

With the front surface of the floppy disk facing ups, fully insert the disk in the arrow direction until a clicking sound is heard.

To eject, press the eject button on the right side of the disk drive. Remove the disk after confirming that the LED lamp is off.

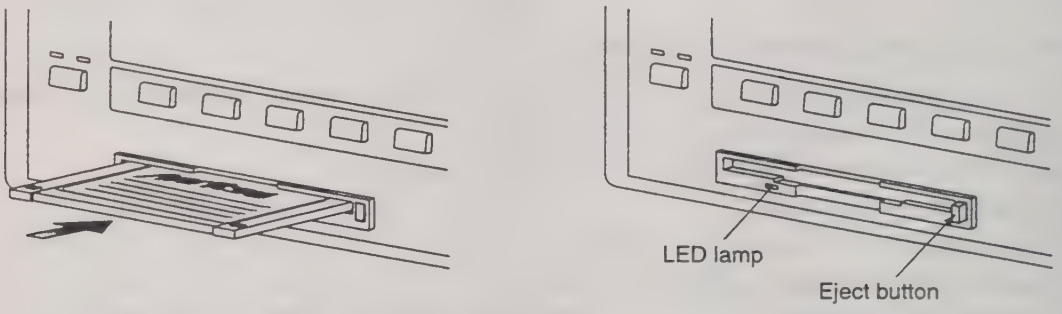



Fig. 2-3 Inserting and Ejecting the 3.5-inch Floppy Disk

# SECTION 3
# PANEL LAYOUT AND OVERVIEW OF OPERATION

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## 3.1 Panel Layout

This paragraph describes the keys, switches, LEDs, and connectors on the front and rear panels of the MT8802A Radio Communication Analyzer.

### 3.1.1 Front panel layout

This paragraph describes the keys, switches, LED, connectors, and the rotary knob on the front panel.

| No. | Display | Function |
|---|---|---|
| 1 | F1,F2,F3,F4,F5,F6 | |
| | | Main function keys |
| | | Group of keys that select and execute the corresponding menus displayed on the LCD screen. |
| | | When the [Main Func] F6 key is on, the menus for F1 to F5 are placed in MT8802A measurement mode. |
| | | When the [Main Func] F6 key is off, the menus of F1 to F5 are displayed for the currently used screen function. |
| 2 | F7,F8,F9,F10,F11,F12 | |
| | | Function keys |
| | | Group of keys that select and execute the corresponding menus displayed on the LCD screen. These screen functions are related to the current operation. |
| 3 | Next Menu | |
| | ▲ | Displays the next page of the function key menu. |
| | ◀ | Displays the next page of the main function key menu. |

| No. | Display | Function outline |
|---|---|---|
| 4 | | Key group for entering data. |
| | Shift | Switches the function of keys with a shift function. When the shift key is pressed, the key's LED goes on. Subsequent operation must be started with this LED on. |
| | BS | Back space key used to correct input data. |
| | 0,.,-/+,1,2,3,<br>A/4,B/5,C/6,D/7,E/8,F/9 | Numeric keys (ten-keypad) used for data input.<br>These keys become alphanumeric keys at shift function activation. |
| | (Definition key group) | The data input using the numeric keys is defined with these keys. |
| | W/GHz/dBm/dB | Validates data when W/GHz/dBm/dB unit system data is input. |
| | mW/MHz/dBμ/sec | Validates data when mW/MHz/dBμ/sec unit system data is input. |
| | μW/kHz/mV/ms | Validates data when μW/kHz/mV/ms unit system data is input. |
| | nW/Hz/μV/μs/Enter | Validates data when nW/Hz/μV/μs unit system data or non-unit system data is input. |
| 5 | Measure | Key group used to start measurement. |
| | Single | Key used to execute measurement once. |
| | Continuous | Key used to execute measurement continuously . |
| 6 | Copy | Outputs display screen to the specified printer.(Hard copy function) |
| 7 | Cursor | Key group used to control the cursor on the LCD screen. |
| | Set | Opens the input window for data in the item pointed to by the cursor. After the completion of data entry, the window is closed. |
| | Cancel | Closes the window. The input data becomes invalid. |
| | ∧ < > ∨ | Moves the cursor. |
| 8 | Step | Key group increment or decrement numeric data. |
| | ∧ | Increments numeric data by the specified step value. |
| | ∨ | Decrements numeric data by the specified step value. |
| | | Entry using these keys is always validated every time the data incremented or decremented. |
| 9 | (Rotary knob) | Knob used for data input. |
| | | When this knob is turned clockwise, the value increases and when it is turned counterclockwise, the value decreases. For input by the rotary knob, data is validated each time it is incremented/decremented.<br>This knob is also used in item selection. |

| No. | Display | Function outline |
|---|---|---|
| 10 | Main Input/Output | Input/output connector for RF signal.(N type connector) |
| 11 | AUX | Auxiliary input/output connectors for RF signal.(TNC connector) |
| | Input | Auxiliary input connector for RF signal. This is used when the output level of DUT is too low. |
| | Output | Auxiliary output connector for RF signal. This is used when the sensitivity of DUT is too low. |
| 12 | AF Input | AF signal input connector for Option 01(Analog), (BNC connector) |
| | AF Output | AF signal output connector for Option 01(Analog), (BNC connector) |
| 13 | DUT Interface | Multi-pole connector used to control the DUT and measure the BER (D-SUB connector, 25-pin, female ). |
| 14 | (Floppy disk drive) | Slot in which the floppy disk is loaded for saving and recalling data, and loading system program. |
| 15 | Stby On | Change-over switch to turn the standby power supply on when the Line Input on/off switch on the rear of this instrument is turned on.<br>In Standby mode, power is only supplied to the reference crystal oscillator. |
| 16 | Panel Lock | Invalidates all key operations except the Panel Lock key and the Stby On power supply switch on the front panel.<br>In lock mode, the LED on this key goes on. |
| 17 | Remote Local | Resets GPIB remote mode and returns to local mode.<br>In GPIB remote mode, the LED (Remote) goes on. |
| 18 | Preset | Initializes measurement parameters. |

## 3.1.2 Rear panel layout

This paragraph describes the switch and connectors on the rear panel.

| No. | Display | Function |
|---|---|---|
| 19 | O I | Input switch for AC power supply.<br>If this switch is turned off, the Power switch on the front panel cannot be turned on. |
| 20 | (Fuses) | Power supply fuses. For safety, always use fuses of the specified rating. |
| 21 | | Frame grounding terminal. For safety, always ground this terminal. |
| 22 | (Memory card cover) | The memory card is built-in. Close the cover for card use. |
| 23 | (Power supply inlet) | For safety, always use a power supply of the rated voltage. |
| 24 | GPIB | GPIB interface connector. |
| 25 | Parallel | Parallel interface connector (conforms to Centronics type).<br>Used to connect printer (D-SUB connector, 25-pin, female). |
| 26 | Serial | RS232C interface connector (D-SUB connector, 9-pin, female). |
| 27 | 10MHz Buffered Output | 10 MHz reference signal (TTL level) for internal use is output (BNC connector). |
| 28 | 10MHz/13MHz Reference Input | 10 MHz or 13 MHz reference signal (2 to 5 Vp-p) is input (BNC connector). |
| 29 | Detector Output | RF burst signal detection output connector (BNC connector). |
| 30 | BER Input | Signal input connectors for measuring bit error rate (BNC connector). |
| | Data | Input connector for measurement data of bit error rate (BNC connector).<br>TTL level signal is input. |
| | Clock | Input connector for clock of bit error rate (BNC connector).<br>TTL level signal is input. |
| 31 | Ext FM Input | External FM modulation signal input connector for Analog measurement, (BNC connector) |
| 32 | Demod Output | FM demodulated signal monitor connector for Analog measurement, (BNC connector) |
| 33 | Ext Trig Input | Input connector for external trigger signal (BNC connector). TTL level signal is input. |
| 34 | Ext Trig Output | Output connector for external trigger signal (BNC connector). TTL level signal is output. |
| 35 | (Fan) | Instrument internal air cooling fan. |
| 36 | CDMA Reference Input | Not used |
| 37 | CDMA Reference Output | Output connector for CDMA clock signal (BNC connector). TTL level signal is output. |
| 38 | CDMA Timing | Connector for CDMA Timing (D-SUB 25 connector, 25-pin, female). |

### 3.1.3 Panel layout

The front panel and rear panel layouts are shown in Figs. 3-1 and 3-2, respectively.

The numbers in the diagram correspond to those in paragraphs 3.1.1 and 3.1.2.

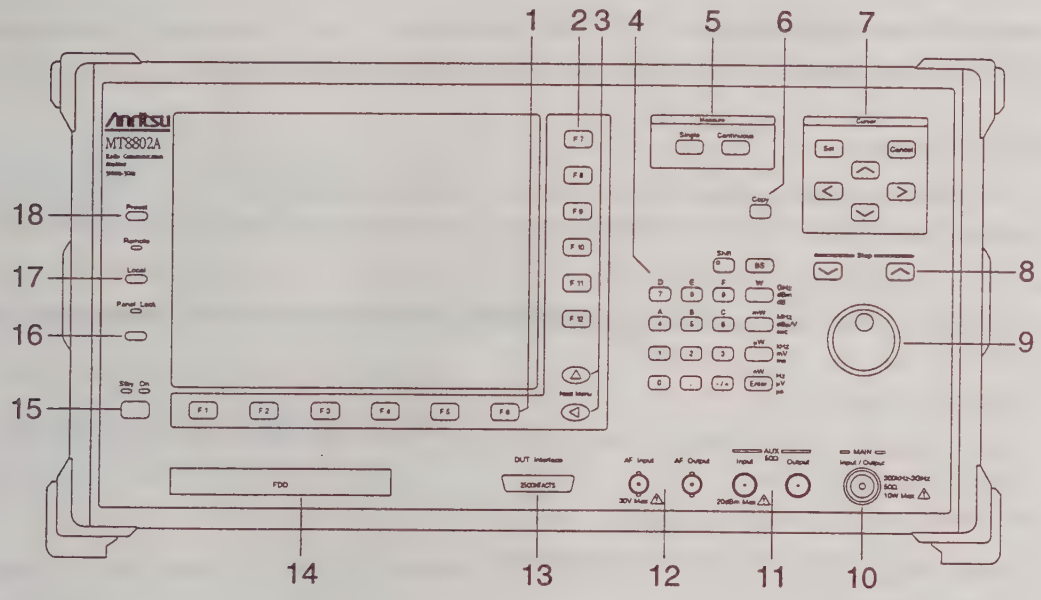


Fig. 3-1 Front Panel

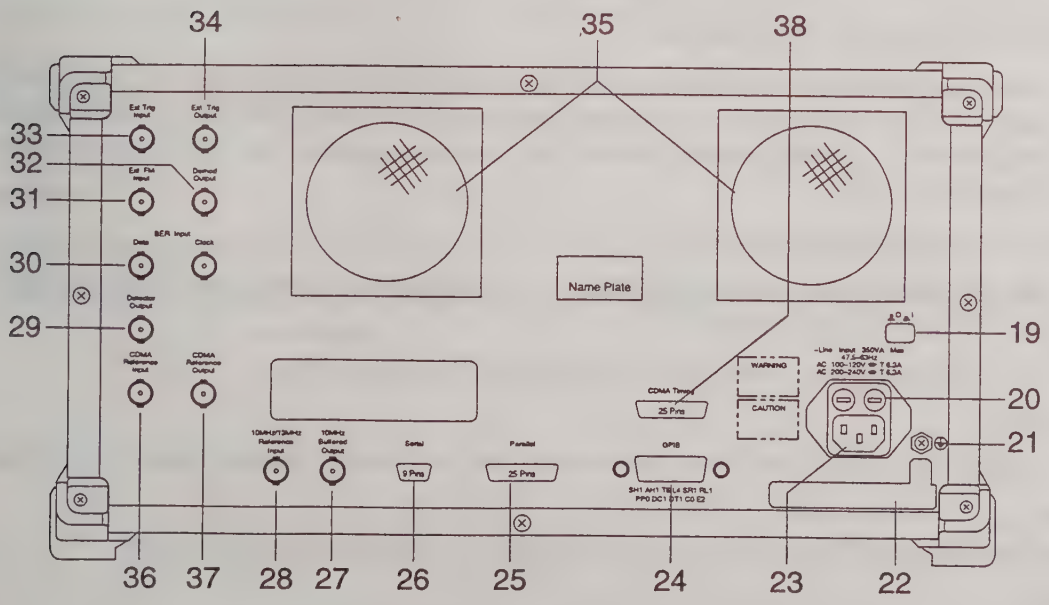


Fig. 3-2 Rear Panel

# 3.2 Overview of Operation

## 3.2.1 Overview of functions

With measurement software MX880215A installed, the MT8802A can test a GSM mobile station (MS) for transmission and reception performance.

- GSM transmission/reception measurements: TX & RX Tester mode

  Using the function menu displayed on the screen, carry out the following measurements:

1. Mobile station control

   The MT8802A originates a call to a mobile station or it receives a call originated by the mobile station, then places the mobile station in the state where transmission and reception measurements can be conducted.

2. Transmission measurement: TX Measure mode

   The MT8802A receives an RF signal from the mobile station to make measurements with respect to the following items:

   - Modulation analysis:

     Carrier frequency, carrier frequency error, phase error: RMS value/maximum value, magnitude error, constellation, I-Q diagram

   - RF power (burst magnitude with magnitude standard-line template) measurement

     Magnitudes at slot/frame/leading-edge/trailing-edge

   - Output RF spectrum
   - Power meter

     Average power using power sensor

   - Automatic all TX selected-item measurement

3. Reception measurement: RX Measure mode

   In the measurement state, a mobile station receives an RF signal (for measurement) from the MT8802A and loops this signal back to the MT8802A. The MT8802A receives the loop-backed RF signal to measure the data BER (Bit Error Rate). A receiving sensitivity can be tested by measuring the error rate at the specified reception level of the mobile station.

4. Call processing: Call Processing mode

   The MT8802A monitors the call processing sequence (origination, termination, disconnection, hand-over) to judge the pass/fail of the sequence.

In addition to the above functions, the MT8802A also supports the following functions:

- Save/recall

  A maximum of 100 measurement conditions (parameters) can be saved on, or recalled from, a 3.5-inch floppy disk.

- Copy

  The screen display can be printed out on the external printer via a parallel interface (Centronics).

- GPIB

  The MT8802A can be remotely controlled using an external controller via a GPIB interface.

- RS232C

  The MT8802A can be remotely controlled using an external controller via a serial interface (RS232C).

## 3.2.2 Overview of operation

At power-on operation begins in "TX&RX Tester" (Transmitter and Receiver test) status (Setup Common Parameter screen).

### (1) Main menu selection

If measurement is to be started from another mode, or from other than a measurement mode, first select one of the main menu items, as shown below.

TX&RX Tester (Transmitter and Receiver test)

Recall (Parameter file recall)

Save (Parameter file save)

File Operation (File retrieval/deletion/protect, FD initialization)

Change System (Measurement system change)

Instrument Set (MT8802A main-frame setting)

Change Color (Selection of screen color)

First press the [Main Func On/Off] F6 key to ON, then select the desired function by using main function keys F1 to F5 and the Next Menu key [◀ ].

### (2) Selection of measurement items

Items are set by using cursor keys ([ ∧ ],[ ∨ ],[ < ], [ > ]), and other function keys while observing the screen menu.

Press the [Set] key to open the input window.

### (3) Item input

For selection items displayed: Select the required value by using the cursor keys or rotary knob.

For mumeric values: Input data using the numeric keys, and validate by pressing a unit key, [Enter] key, or [Set] key. The window closes.

### (4) Outline of screen configuration

The screen configuration is shown below. A tree-shaped Hierarchical configuration of items below each the main menu is indicated. (Details of operation are explained in Section 4. The screens, setup items and function key flowchart for each screen are summarized in Appendix A, "Screen and Function Key Transition Diagrams.")

[Overview of screens]

- TX&RX Tester mode
  - Setup Common Parameter screen
    (Measurement Condition Set screen common to TX and RX Measure modes)
    - TX Measure mode
      - Setup TX Measure Parameter screen
        (TX Measurement Condition Set screen)
      - Select All Measure Item screen
        (TX All Measurement-Value-List Item Set screen)
      - All Measure screen
        (TX All Measurement-Value-List Measure screen)
      - Modulation Analysis screen
        (TX Modulation-Analysis screen --- Numeric display)
        - Constellation screen, Eye Diagram screen, Phase Error screen, Magnitude Error screen
          (TX Modulation Analysis screens --- 4 waveform displays)
      - RF Power screen
        (TX RF Power (Burst Magnitude) Measure screen)
        - Setup Template screen
          (Template Set screen)
      - Output RF Spectrum screen
        (RF Output Spectrum Measure screen)
      - Power Meter screen
        (TX RF Power (Average) Measure screen)
    - RX Measure mode
      - Setup RX Measure Parameter screen
        (RX Measurement Condition Set screen)
      - Bit Error Rate screen
        (RX Bit Error Rate (BER) Measure screen)
    - Call Processing mode
      - Setup Call Processing Parameter screen (Call Processing Test Condition Set screen)
      - Sequence Monitor screen (Call Processing Operation Sequence Display screen)

- Recall mode
  - Recall Parameter screen
    (Screen for recalling parameter-file)
- Save mode
  - Save Parameter screen
    (Screen for saving parameter-file)
- File Operation mode
  - File Operation screen
    (Screen for file retrieval/deletion/protection-setup in FD, and FD initialization)
- Change System mode
  - Change System screen
    (Screen for changing TX&RX Tester mode measurement system)
- Instrument Setup mode
  - Instrument Setup screen
    (Screen for setting up RS232C/GPIB, etc. for MT8802A main frame)

Note: Change Color mode (Selection for screen display color) is setup using the function key menu. There is no screen in Change Color mode.

# SECTION 4
# OPERATION

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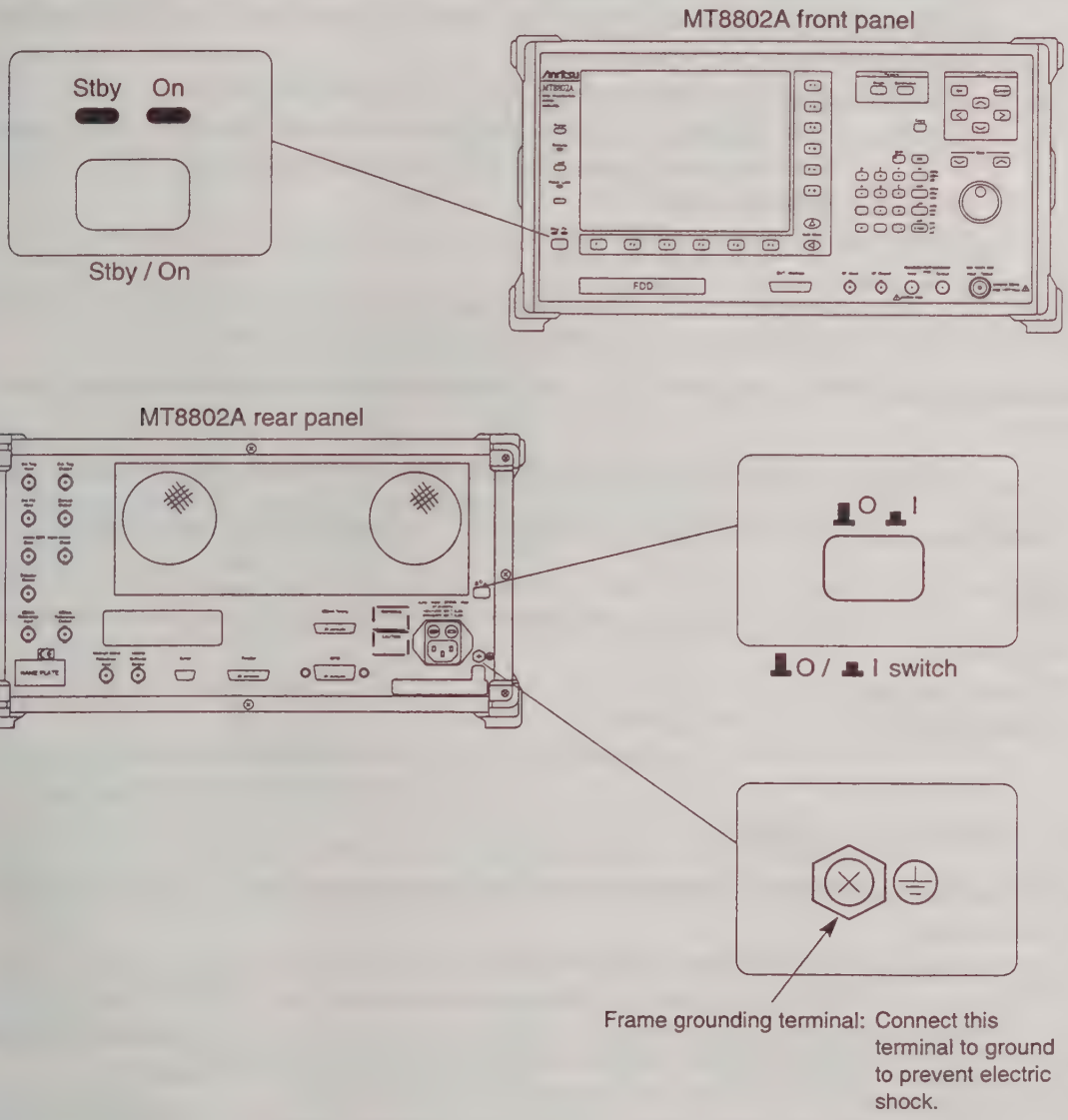
## 4.1 Turning on and off the Power

The RCA has two power switches: The Stby/On switch on the front panel and ⏻ (main power) switch on the rear panel.




### WARNING ⚠

• Protective grounding

If the power is turned on without protective grounding, operator runs the risk of electric shock. If the RCA does not have a three-pole (grounding type two-pole) power outlet, be sure to connect the frame grounding (FG) terminal on the rear panel or ground terminal of the accessory power cable to ground before turning on the RCA power.

## CAUTION ⚠

• Checking the power supply voltage

If the AC power supply voltage is improper, abnormal voltage may damage the mechanism inside the equipment. Confirm that the AC power supply voltage is within the specified rating before turning on the RCA power.

The following shows the specified power supply voltage and frequency:

Voltage: 85 to 132 Vac or 170 to 250 Vac (Because an automatic input voltage rating switching system is used, the rating need not be switched.)

Frequency: 47 to 63 Hz

For normal RCA operation, leave the power switch on the rear panel set to on when the AC power inlet is connected to the power outlet, and only use the Stby/On switch on the front panel to turn the power on and off.

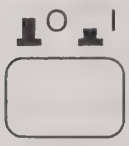
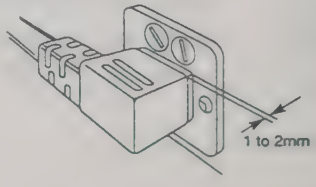
Check the power display lamps at the lower-left part of the front panel as listed in the table below to confirm the power supply state.

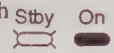
Table 4-1 Power Display Lamp Indications and Power Supply States

| Display lamp / State | Power standby display lamp (green) (Stby) | Power on display lamp (orange) (On) |
|---|---|---|
| Main power off | Off | Off |
| Only main power on | On | Off |
| All power supplies on | Off | On |

### 4.1.1 Turning on the Power

Perform the power-on procedure through warming up the internal reference oscillator to normal RCA operation in order of the following steps:

| Step | Operation | Description |
|---|---|---|
| 1. | Connect the frame grounding terminal on the rear panel to ground. | • When using a three-pole power cable with a grounding terminal, the RCA need not be grounded. |
| 2. |  Set the O I switch on the rear panel to O (Off). | • When the button is pressed down and set, it is I (On). Press the button again to release it. When the button is set Off, the AC power is turned off even if the power switch on the front panel is set On. |
| 3. | Connect the power cable jack to the AC power inlet on the rear panel. | • Fully insert the power cable jack so that there is a gap of 1 to 2 mm as shown in the figure below. |
| 4. | Connect the power cable plug to the AC power outlet. |   |

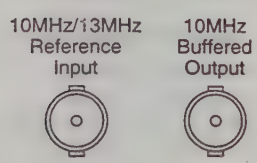
| Step | Operation | Description |
|---|---|---|
| 5. | Set the O I switch on the rear panel to I (On) | • The Stby lamp on the front panel power switch lights.  • The reference crystal oscillator circuit built in the RCA starts to warmed up. Before operating the RCA under low temperatures, warm up the crystal oscillator for 24 hours. The table below lists the stability of the crystal oscillator based on the warm-up time. |
| 6. | Hold down the Stby/On switch on the front panel for a few seconds to set it On. | • The On lamp on the front panel power switch lights and the Stby lamp goes off. • Power is supplied to all circuits in the RCA, then the RCA becomes operable. |

Crystal oscillator stability

| Item | | Stability |
|---|---|---|
| Starting characteristics | After 30-minute operation | $5 \times 10^{-8}$/day or less |
| Aging rate (after 24-hour operation) | | $2 \times 10^{-8}$/day or less |
| Stability at ambient temperature change of crystal oscillator (25°C ±25°C) | | $\pm 5 \times 10^{-8}$ or less |

Notes: If neither power display lamp lights, check the following:

1. Is the power cable properly connected to the power inlet and power plug?
2. Are the specified fuses set in the fuse holders?
3. Is the power supply voltage correct?




Notes: The left figure shows the reference signal input/output connectors on the RCA rear panel. The internal 10 MHz reference signal is output from the 10 MHz OUTPUT connector at TTL level. When the internal reference signal is not used, input an external reference signal satisfying the following conditions to the 10 MHz/13 MHz Reference Input connector:

i) Frequency: 10 MHz ±1 ppm, signal level: 2 to 5 Vp-p

ii) Frequency: 13 MHz ±1 ppm, signal level: 2 to 5 Vp-p

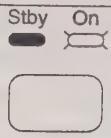
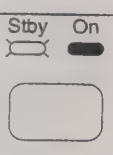
Set the reference frequency on the Instrument Setup screen (see paragraph 4.3.1) according to the external reference signal used as described in i) and ii) above.

Warm up the external reference signal equipment separately from warming up the RCA.

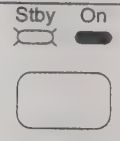
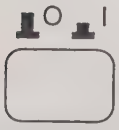
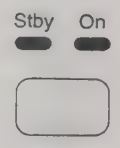
### 4.1.2 Turning off the Power

Turn off the power as described below.

(1) Normal power-off procedures

| Step | Operation | Result check |
|---|---|---|
| 1. | Stby On<br>  <br>Press the Stby/On switch on the front panel for a few seconds to set it to Stby state. | • The On lamp of the Power switch on the front panel goes off, and the Stby lamp lights.<br>• Only the internal reference crystal oscillator is turned on.<br>  |

(2) Power-off procedures for storage or long stop

| Step | Operation | Result check |
|---|---|---|
| 1. | Stby On<br> <br>Press the Stby/On switch on the front panel for a few seconds to set it to Stby state. | • The On lamp of the power switch on the front panel goes off and the Stby lamp lights.<br>• Only the internal reference crystal oscillator is turned on.<br>  |
| 2. |  <br>Set the O I switch on the rear panel to the O (off) position. | • The AC power is turned off. Both the Stby and On lamps of the Power switch on the front panel go off.<br>• Only the internal reference crystal oscillator is turned on.<br>  |

### 4.1.3 Setup state after power-on

- The Setup Common Parameter screen is displayed shortly after power-on. At this time, parameters can be set by specifying Power-On Initial on the Instrument Setup screen.(See paragraph 4.3.3.)
- If a short power failure occurs, the power switch on the front panel goes Off. In this case, press the power switch On again.

## 4.2 Screen Descriptions

This paragraph describes the common items displayed on the screen.

### (1) Screen layout

The composition of the measurement screen is described below.

- Title display area
  The model number, "MT8802A", and date (**_**_**) time (**:**:**), or user-defined character string (title) are displayed on the top left line. These are set on the Instrument Setup Screen.
- Screen name display area
  The screen name (paragraph 3.2.2 (4)) and measurement system name(GMS) are displayed on the second line from the top left.
- Measurement error messages display area
  Messages for errors generated during measurement are reverse displayed on the third line from the top left.
  There are 8 measurement error messages as follows. TX messages are shown in high priority order.

  [TX measurement]

| Priority | | |
|---|---|---|
| High | Input Level Over | RF input level exceeded the hardware limit. |
| ↑ | Level Over | Level too high |
| ↓ | Level Under | Level too low |
| | Signal Abnormal | Measurements cannot be carried out. |
| Low | Unique Word Not Found | Sync word cannot be detected |

  [RX measurement]

| | |
|---|---|
| Pattern Sync Being Established | |
| Pattern Sync Loss | |
| Over Flow | Mesured data is over flowed. |

- RF input/output display
  "M" or "A" displayed on the first line from the top center indicates the RF connector used.
  M: Main Input/Output
  A: AUX Input/Output
- Calibrated display
  If the RCA is already calibrated, "C" is displayed on the second line from the top center.
  This is appeared after executing calibration on the Modulation Analysis screen etc..
  C: Calibrated
- User calibration factor setting display
  If a user calibration coefficient is being set, "U" is displayed on the third line from the top center.
  This is appeared when the user Cal. factor is set to any value other than 0.00 dB at the Setup TX Measure Parameter screen.
  U: User Cal. Factor

- Measurement mode display area

  The measurement mode is displayed on the first line from the top right.

  This is appeared depending on the Measure key (Continuous/Single).

  | | | |
  |---|---|---|
  | Measure: | Continuous: | Continuous measurement |
  | Measure: | Single: | Single (one time) measurement |

  In average storage mode, nothing is displayed in this area.

- Storage mode display area

  The displayed value or waveform storage mode is displayed on the second line from the top right.

  This is the setting value of the storage mode on the current measurement screen.

  Storage:

  | | |
  |---|---|
  | Normal: | Normal display |
  | Overwrite: | Trace data overwriting |
  | Average : | Averaging |

  (order of storage operations performed and total number of operations)

  | | |
  |---|---|
  | Wide dynamic range: | Wide dynamic range |
  | Max Hold: | Maximum value held |
  | Min Hold: | Minimum value held |
  | Cumulative: | Dot data accumulation display |

- Call Processing status display area

  The current Call Processing status is displayed in the third line on the top right.

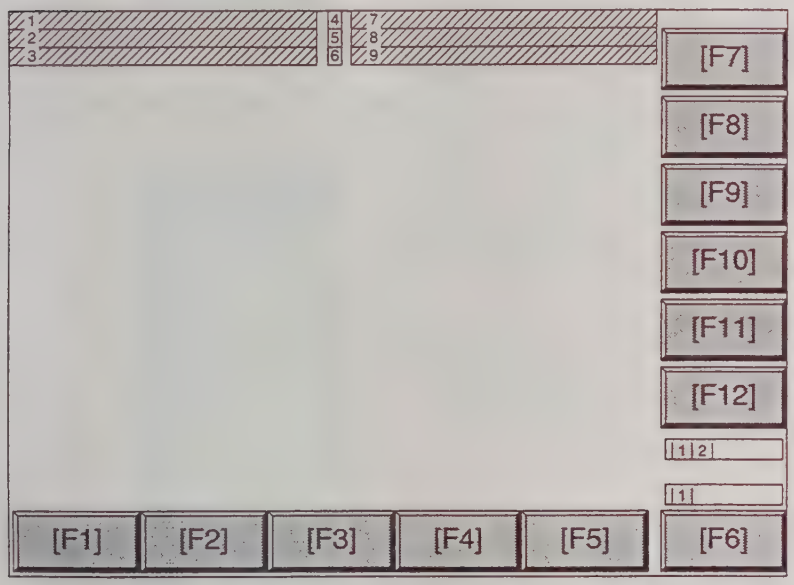
  Call Processing:

  | | |
  |---|---|
  | Off: | Indicates that the DUT Control of the RCA is set to None on the Setup Common Parameter screen. |
  | Stop: | Indicates that the DUT Control of the RCA is set to Call Proc on the Setup Common Parameter screen and that the Call Processing status is stopped. |
  | Idle: | Indicates that the DUT Control of the RCA is set to Call Proc on the Setup Common Parameter screen and that the Call Processing status is ready. |
  | Paging: | |
  | Radio Link: | |
  | Registration: | |
  | Origination: | |
  | Termination: | |
  | Communication: | Indicates that the DUT Control of the RCA is set to Call Proc on the Setup Common Parameter screen and that the Call Processing status is Communication. |
  | Hand Over | |
  | Disc from MS | |
  | Disc from NT | |
  | Radio Disc | |

• Menu display area

The titles of up to six main function keys (F1 to F6) are displayed horizontally along the bottom.
When the [Main Func on off] (F6) key on the right is set to On, the main function menu is displayed.
When the [Main Func on off] (F6) key is set to Off, the menu is displayed according to the screen contents.
Use the Next Menu [◀ ] key to display the next page.
The display of 1 (first page), 2 (second page), or later above the F6 menu indicates the current page.

The titles of up to six function keys (F7 to F12) are displayed vertically along the right side.
The display of 1 (first page), 2 (second page), or later under function key F12 indicates the menu page number.
The current page is reverse displayed. If there are multiple pages, use the Next Menu [▲] key to display the next page under the F12 key.




1. Title/date and time
2. Screen name
3. Measurement error or measurement being performed
4. RF input switching
5. Calibrated display
6. User Cal display
7. Measurement mode
8. Storage mode
9. Call Proc and trace format

Fig. 4-1 Screen Layout

### (2) Function keys

The symbols displayed on the top right of the function keys indicate the following functions:

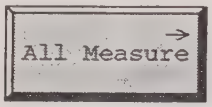
*: Indicates a lower level function key is displayed when this function key is pressed.

->: Indicates the screen is changed by pressing this function key.

#: Indicates a window is opened to set a value using the ten-keypad, Step key, or rotary knob when this function key is pressed.

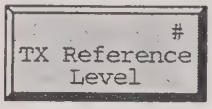
(a) Menu for transition to lower hierarchy screen

(The Back screen key switches the current screen to the higher hierarchy screen.)




(b) Menu for transition to lower hierarchy menu

(c) Menu for opening the value setting window

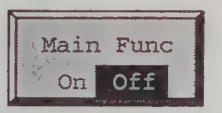


• Function key menu that select setting item:

One of the multiple selection keys (displayed in the same menu hierarchy) can be selected. The frame of the selected key is reverse displayed. (See para. (e) below.)

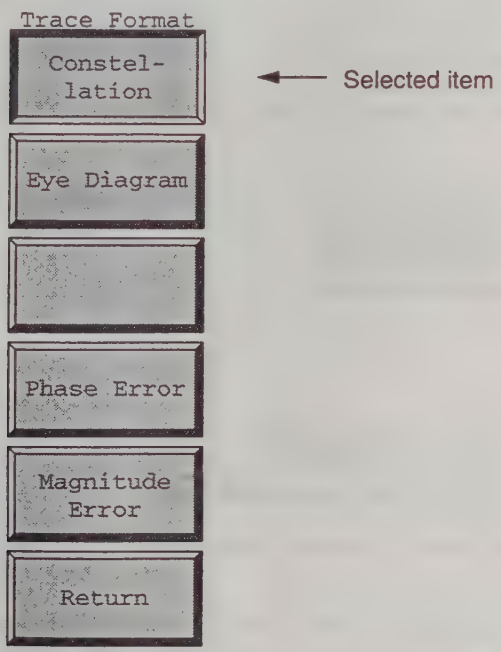
The setting values displayed in a key are changed alternately. When such a key is selected, the set value is reverse displayed. (See para. (d) below.)

(d) Menu on which set items are switched alternately (alternate key menu)




(e) Menu on which a set item is selected

[Example of the function key menu]



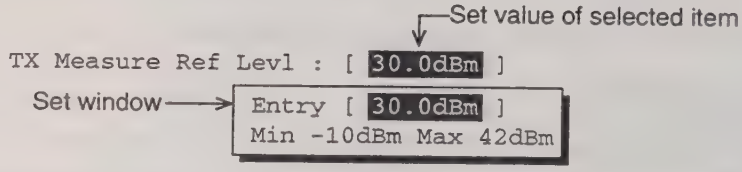

[Example of the main function key menu]

### (3) Entering the data

#### (a) Entering numeric data by opening/closing the window

##### (i) Entering numeric data by moving the cursor and opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The value setting window shown below is opened and numeric data can be set.

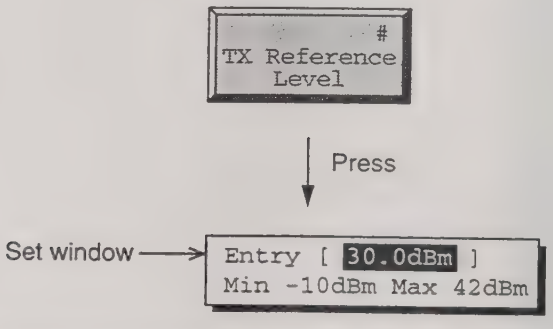



When a value is entered using the ten-keypad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

##### (ii) Entering numeric data by pressing a function key or main function key

When the key marked # on the top right of the menu is pressed, the value setting window shown below is opened and numeric data can be set.




When a value is entered using the ten-key pad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed.

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

#### (b) Entering selection item by opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The selected item setting window shown below is opened and the selected item can be set.

When an item in the window is selected using the cursor keys and the Set key is pressed, the set value is defined and the window is closed.

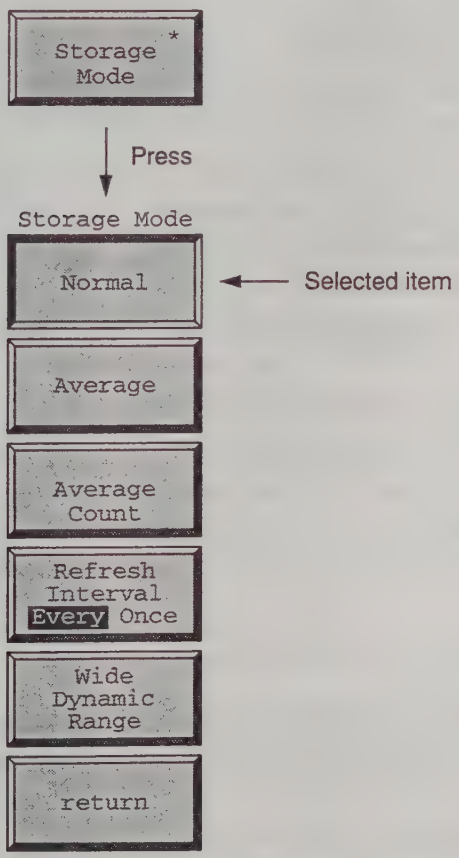
(c) Entering selected items using alternate keys

Selection items are displayed on the function key menu. Each time one of these keys is pressed, set values are switched alternately. The currently selected item is reverse displayed.

(d) Entering selected items using function keys with lower hierarchy

When the key marked * on the top right of the menu is pressed, the menu set of the lower hierarchy shown below is displayed.

Select an item from the menu set and press the corresponding function key. The menu display of the selected item is changed. When the return function key is pressed, display returns to the menu set of the higher hierarchy.




(e) Entering the title

See paragraph 4.3.3, "Instrument Setup screen."

## 4.3 GSM Transmitter and Receiver Test --- TX and RX Tester Mode

This paragraph describes operation when using the RCA in which MX880215A measurement software (GMS) is installed to measure the GSM transmitter and receiver.

### 4.3.1 Preparations

This paragraph describes the setup, zero-point calibration of the power meter, and RF cable loss correction when measuring the DUT.

(1) Setup

This following explains how to set the RCA and device under test (DUT) when conducting tests.

Setup:

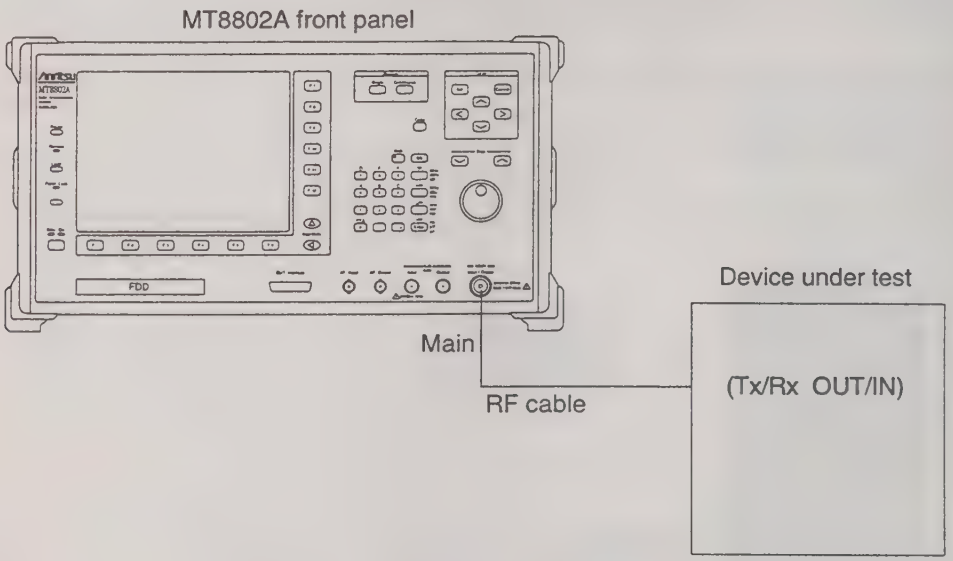



Fig. 4-2

[DUT Interface connector]

The DUT Interface connector is equipped on the bottom of the RCA front panel to transmit and receive signals for control and measurement. However, in the GSM system, the RCA controls the DUT using the Call Processing function, so does not use this connector.

(2) Calibration before measurement

The RCA has two types of power measurement functions.
For high precision measurements, calibrate the RCA as shown below.

(a) Power meter function

Press the [Power Meter] F12 key in TX/RX Tester mode to set the power meter function.

The power meter function uses a thermo-couple to measure the average power with high precision.

Calibrate the RCA at the zero power point for high-precision measurements.

Zero-point calibration: Disconnect anything from the Main Input/Output connector to set no input power, and press the [Zero Set] F11 key to automatically calibrate the power meter at the zero power point.

For details on operation, see Paragraph 4.3.6, (6) "Power Meter."

Note: The power meter function is effective only when the Main connector is used.

(b) Burst-power measurement function

Press the [RF Power] F9 key in TX/RX Tester mode to set the burst-power measurement function.

This function measures the on/off power, rise/fall times etc. of burst signals. For high precision measurement, internal calibration is required.

There are two types of internal calibrations of the Adjust Range and Manual Calibration, as described below.

Adjust Range: Optimizes the internal RF ATT, A/D input level, and power meter range of the RCA for the signal to be measured. This function can increase the measurement range for the on/off ratio and adjacent channel leak power.

Manual Calibration: Calibrates the measured power value in the RF Power screen using the RCA built-in power meter.

Pressing the Calibration Cancel key clears the calibration factor to 0 dB.

The calibration factor may become incorrect when the internal temperature rises, the ambient temperature changes, the measurement frequency changes etc.. For precise measurement of the TX power, perform Manual Calibration at that time.

For details on operation, see Paragraph 4.3.6 "Transmitter Test."

Notes:
- Manual Calibration is effective only when the Main connector is used.
- The Adjust Range and Manual Calibration run a common internal process in all TX measurement screens. Once calibration is performed in any TX measurement screen, no more calibration is required in any other screen.
- If the RCA input level is small or the input frequency does not match the setup frequency, the Adjust Range and Manual Calibration may not be performed properly.
- Execute Adjust Range and Manual Calibration while the measurement signals are input stationary.
- When performing Manual Calibration results in an error (corrected data cannot be generated), calibration factor of the Manual Calibration (held before the execution) is lost.

### (3) Correcting RF cable loss when conducting the transmitter test (TX Measure mode): Setting User Cal Factor

When conducting the transmitter test (TX Measure mode), set the loss of the RF cable connecting the RCA and transmitter under test as a correction value (User Cal Factor) to measure RF power in the transmitter under test.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1<br>Next Menu [▲]<br>[Setup TX Parameter]F9 | Displays the first page of the TX Measure menu.<br>Displays the second page of the TX Measure menu.<br>Displays the Setup TX Measure Parameter screen. |
| 4. | Cursor [∧] [∨] | Moves the cursor to User Cal Factor. |
| 5. | [Set][-/+] [0] [1] to [F/9] [BS] | Enter the RF cable loss.<br>Example: For 5 dB loss, enter 5.00 dB. |
| 6. | [Enter] | Defines the entered value. |
| 7. | [Back Screen]F12 | Returns to the Setup Common Parameter screen. |

### (4) Correcting RF cable loss when conducting the receiver test (RX Measure mode): Setting Offset Value

When conducting the receiver test (RX Measure mode), use the loss of the RF cable connecting the RCA and receiver under test as a correction value (Offset Value) to measure RF power in the receiver under test as follows.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets the TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [RX Measure]F2<br>[Bit Error Rate]F7 | Displays the RX Measure menu.<br>Displays the Bit Error Rate screen. |
| 4. | [Level]F3<br>Next Menu [▲] | Displays the first page of the Level menu.<br>Displays the second page of the Level menu. |
| 5. | [Offset Value]F7 | Opens the Offset Value window. |
| 6. | [-/+] [0] [1] to[F/9] [Shift/o] [BS] | Enter the RF cable loss.<br>Example: For 5 dB loss, enter -5.00 dB. |
| 7. | [Enter] | Defines the entered value. |
| 8. | [Offset On Off]F8 | Sets Offset On. Offset is displayed in the RF output level display field. |
| 9. | [Back Screen]F12 | Returns to the Setup Common Parameter screen. |

### 4.3.2 Selecting and changing the measurement system: Change System screen

Change the measurement system according to the following steps.
For measurement after change, refer to the manual of the selected measurement system.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on.<br>The Main Menu appears at the bottom of the screen. |
| | Next Menu [◀ ] | Displays the second page of the Main Menu. |
| 2. | [Change System]F1 | Sets Change System mode.<br>The Change System screen and System menu appear. |

This screen is used to select anyone of measuring systems and to upgrade the system software.

Note: Changing any measuring system in this screen initializes the corresponding measurement parameters. Save the parameters before changing if necessary.

#### (1) Changing the built-in measuring system

This paragraph describes how to exchange the measuring system used when more than one measuring systems are built in the RCA.

| Step | Key operation | Description |
|---|---|---|
| 1. | | Make sure that "Current System" shows the system currently selected and that "Application Memory" contains a new measuring system to select. |
| 2. | [Change System]F7 | Sets Change System mode.<br>Displays one of the measuring system softwares in the "Application Memory" in reverse display. |
| 3. | Cursor [∧] [∨] | Select one of the measuring system softwares in the "Application Memory". |
| 4. | Set | Confirms the measuring system software. |

#### (2) Loading measuring systems from an external floppy disk

This paragraph describes how to load measuring systems from an external floppy disk.
(This function is effective only when the measuring software floppy disk is used.)

| Step | Key operation | Description |
|---|---|---|
| 1. | | Set the floppy disk containing measuring system files in the floppy disk driver of the RCA. |
| 2. | [Floppy Disk Dir]F8 | Displays measuring system files on the floppy disk. Here, confirm the "Unused area" under "Application Memory", and also the size of the measuring systems on the floppy disk.<br>The measuring systems can be loaded when the value in "Unused area" is greater than size of measuring systems to be loaded. |
| 3. | [Install system form FD]F10 | Loads measuring system from the floppy disk to "Application Memory." |
| 4. | Set | Make sure that the measuring systems are displayed(saved) in "Application Memory." |

### 4.3.3 Setting the measurement system conditions: Instrument Setup screen

Set the standard frequency of the measurement system (10 MHz or 13 MHz), RF connector (Main or AUX), screen title/ date/time display, interface (GPIB or RS232C), printer (ESC/P), and alarm (on or off) on this screen.

Procedure for transition to the Instrument Setup screen

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets Main Func on.<br>The Main Menu appears at the bottom of the screen. |
| | Next Menu [◀ ] | Displays the second page of the Main Menu. |
| 2. | [Instrument Setup]F2 | Sets Instrument Setup mode.<br>The Instrument Setup screen appears.<br>The Instrument Setup function key menu appears on F7 to F12. |

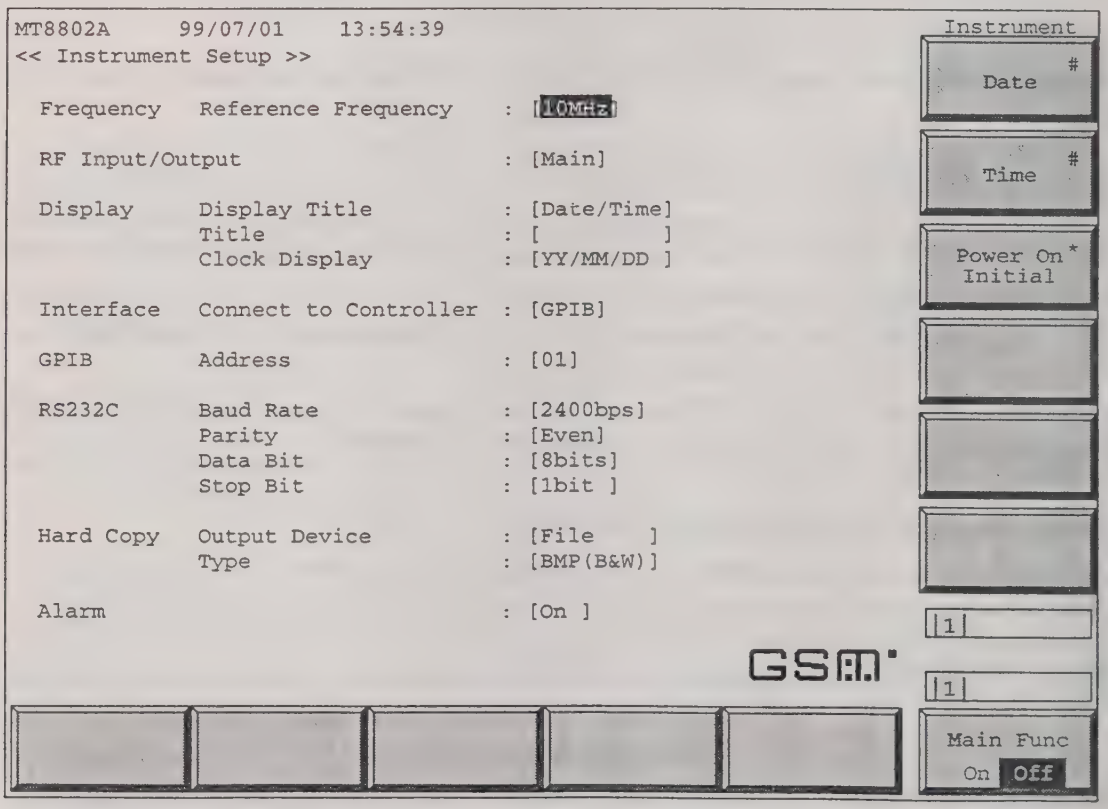



Fig. 4-3 Instrument Setup Screen

• Set the following items:

| Item | Range | Initial value |
|---|---|---|
| Frequency | | |
| Reference Frequency | | |
| | 10 MHz, 13 MHz | 10 MHz |
| RF Input/Output | Main, AUX | Main |
| | Main In/AUX Out | |
| | Main Out/AUX In | |
| Display | | |
| Display Title | | |
| | User Define, Date/Time, Off | User Define. |
| Title | User Define, Date/Time, Off | |
| | (32 alphanumeric characters) (*1) | |
| Clock Display | | |
| | YY/MM/DD (year, month, day) | |
| | MM-DD-YY (month, day, year) | |
| | DD-MM-YY (day, month, year) | YY/MM/DD (year, month, day) |
| Interface | | |
| Connect to Controller | | |
| | GPIB, RS232C | GPIB |
| GPIB | | |
| Address | 00 to 30 | 01 |
| RS232C | | |
| Baud Rate | 1200, 2400, 4800, 9600 (bps) | 2400 |
| Parity | Even, Odd, Off | Even |
| Data Bit | 7 bits, 8 bits | 8 bits |
| Stop Bit | 1 bit, 2 bits | 1 bit |
| Hard Copy | | |
| Output device | Printer (Parallel), File | Printer (Parallel) |
| Type | ESC/P, HP2225... for Printer (Parallel) | ESC/P |
| | BMP (B&W)... for File | |
| Alarm | On, Off | On |

*1 Entering the title:

A title up to 32 characters can be entered in the title display area. (User Define)
MT8802A**_**_**(date)**:**:**(time) is displayed as an initial value. (Date/Time)
Enter a title according to the following steps. (User Define)

| Step | Key operation | Description |
|---|---|---|
| 1. | Cursor [∧] [∨] | Moves the cursor to the Title entry area. |
| 2. | [Set] | Opens the Tile entry window. |
| 3. | Step [∧] [∨] | Moves the cursor into position in the Title entry area to enter character. |
| 4. | Cursor [<] [>] | Select a character. |
| 5. | [Enter] | Defines the character. |
| 6. | [BS] | Correct any incorrect character. |
| 7. | | Repeat steps 3 to 6 to enter all characters in the Title entry area. |
| 8. | [Set] | Defines the entered character string. |

• Function keys

Main function key: None

Function keys:

[Date]F7: Opens the date entry window.

[Time]F8: Opens the time entry window.

[Power On Initial]F9: Displays the Power On menu to select Initialization modes, which are classified into Previous Status and Recall File.
Initial value: Previous Status
When Previous Status mode is selected, the parameters after power-on retain the status held before the previous power-off.
When Recall File mode is selected, the parameters after power-on are set by reading the specified file.

[Previous Status]F7 Sets the parameters after power-on to the status held before the previous power-off.

[Recall File]F8 Accesses the floppy disk to call the parameter file list.

[File No.]F9 Opens the parameter-file setting-location (number) entry window.
File No.: 0 to 99, Initial value: 0

[return]F12 Returns to the previous menu.

• Selecting Power On Initial mode

The following describes how to select parameter initialization mode after power-on.

1. Selecting Previous Status mode

| Step | Operation |
|---|---|
| 1. | Press the [Power On Initial] F9 key. |
| 2. | Press the [Previous Status] F7 key. |
| 3. | Press the [return] F12 key to define the parameters then return to the previous menu. |

2. Selecting Recall File mode (being developed)

| Step | Operation |
|---|---|
| 1. | Press the [Power On Initial] F9 key. |
| 2. | Set the floppy disk (on which parameters to be read before power-on are written) in the floppy disk drive. |
| 3. | Press the [Recall File] F8 key. (Access the floppy disk to call the parameter list file.) |
| 4. | Display the parameter file to be set on the screen. |
| 5. | Press the [File No.] F9 key. (Open the parameter-file setting-location [number] window.) |
| 6. | Enter the number of the parameter file to be set. |
| 7. | Press the [Set] key to define the parameters, then press the [return] F12 key to return to the previous menu. |

Notes:
- If no floppy disk is set before power-on or a floppy disk other than that used at setting is used, parameters may be set in Previous Status mode or different parameters may be set.
- The ambient temperature range of the floppy disk is specified as 5 to 45 °C. If a set temperature is outside the specified range, operation is not guaranteed.

• Changing the time and date of the built-in clock

1. Changing the date

| Step | Key operation | Description |
|---|---|---|
| 1. | [Date]F7 | Opens the date setting window. |
| | | Displays the current date and time of the built-in clock. |
| 2. | Cursor [∧] [∨] | Moves the cursor to the part to be changed. |
| 3. | [Set] | Opens the setting window. |
| 4. | 0 to 9, [BS] | Sets the data. |
| 5. | [Set] | Closes the setting window and establishes the set value. |

2. Changing the time and date of the built-in clock

| Step | Key operation | Description |
|---|---|---|
| 1. | [Date]F7 | Opens the time setting window. |
| | | Displays the current time of the built-in clock. |
| 2. | Cursor [∧] [∨] | Moves the cursor to the part to be changed. |
| 3. | [Set] | Opens the setting window. |
| 4. | 0 to 9, [BS] | Sets the data. |
| 5. | [Set] | Closes the setting window and establishes the set value. |

Note: To stop changing the date or time of the built-in clock

To stop changing the date or time after opening the setting window of the built-in clock, press the [Cancel] key in the above Step 4 or 5 (do not use the [Set] key). If the [Set] key is pressed again after the date and time window is opened, the value on the setting window is set again. The date and time window remains in the state when the window was opened. Therefore, if the [Set] key is pressed without changing the display on the window, the date and time of the built-in clock are delayed.

### 4.3.4 Setting the screen display color: Change Color menu

To set a screen color, display the Change Color menu as follows.

(The F7 to F12 function keys menu changes to the Change Color menu, but the screen does not change.)

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets Main Func on.<br>The Main Menu appears at the bottom of the screen. |
| | Next Menu [◀ ] | Displays the second page of the Main Menu. |
| 2. | [Change Color]F3 | Sets Change Color mode.<br>The Change Clr. function key menu appears on F7 to F12. |
| 3. | | Use the function key on the next page to set a color. |
| 4. | [return]F12 | Returns to the previous menu. |

• Function keys

Main function key: None

Function keys:

Change Color menu: Initial value: Color Pattern 1

[Color Pattern 1] F7: Selects Anritsu-specified color 1.

[Color Pattern 2] F8: Selects Anritsu-specified color 2.

[Color Pattern 3] F9: Selects Anritsu-specified color 3.

[Color Pattern 4] F10: Selects Anritsu-specified color 4.

[Define User Color] F11: Displays the Define Clr. menu to set a user-specified color.

[Copy Color Ptn from] F7 Displays the [Copy from] menu to select an Anritsu-specified color as an original color to set a user-specified color.

[Color Pattern 1] F7: Selects Anritsu-specified color 1 as an original color.

[Color Pattern 2] F8: Selects Anritsu-specified color 2 as an original color.

[Color Pattern 3] F9: Selects Anritsu-specified color 3 as an original color.

[Color Pattern 4] F10: Selects Anritsu-specified color 4 as an original color.

[return] F12: Returns to the previous menu.

[Select Item frame **] F8: Selects the screen configuration field to set a display color.
Use a number ** from 0 to 16 for this setting. The number increases in step of one by pressing this key.

[Red *] F9: Set red intensity of the item frame selected by F8.

[Green *] F10: Set green intensity of the item frame selected by F8.

[Blue *] F11: Set blue intensity of the item frame selected by F8.

[return] F12: Returns to the previous menu.

[return] F12: Returns to the previous menu.

• Relation between screen assignment and number ** in [Select Item Frame **] F8 key

| | |
|---|---|
| [Select Item Frame 0] | Back-screen of function keys |
| [Select Item Frame 1] | Back-screen of the main function keys |
| [Select Item Frame 2] | Display frame of function and main function keys |
| [Select Item Frame 3] | Characters and display frame of function and main function keys |
| [Select Item Frame 4] | Back-screen of waveform display |
| [Select Item Frame 5] | Scale line and frame of waveform display |
| [Select Item Frame 6] | Waveform display (1) |
| [Select Item Frame 7] | Waveform display (2) |
| [Select Item Frame 8] | Display other than function and main function keys |
| [Select Item Frame 9] | Characters right over the main function keys |
| [Select Item Frame 10] | Measurement execution error display |
| [Select Item Frame 11] | Template and zone frames |
| [Select Item Frame 12] | Marker |
| [Select Item Frame 13] | Window back-screen |
| [Select Item Frame 14] | Window shade and characters |
| [Select Item Frame 15] | (Not used) |
| [Select Item Frame 16] | Back-screen |

### 4.3.5 Setting the common measurement parameters: Setup Common Parameter screen

• Switch to the Setup Common Parameter screen according to the following steps.
Set common measurement conditions on this screen.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | The TX Measure (for transmitter test) function keys appear on F1 to F12. |
| | [RX Measure]F2 | The RX Measure (for receiver test) function keys appear on F1 to F12. |
| | [Call Processing]F3 | The Call Processing (for Sequence Monitor) function keys appear on F1 to F12. |

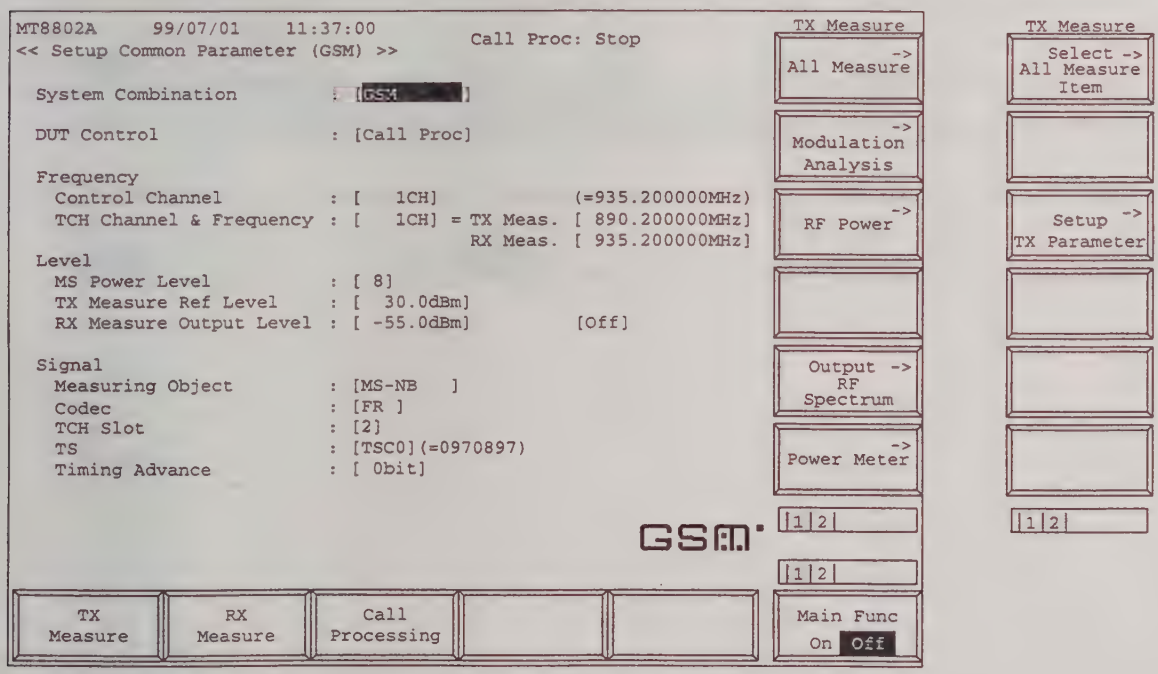
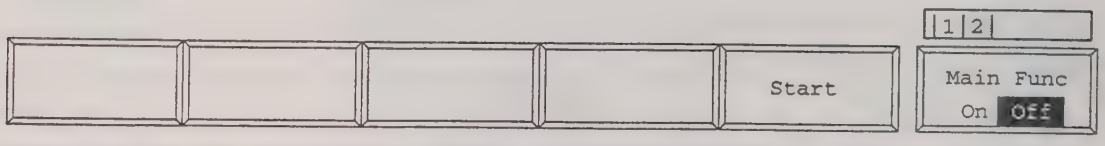



Fig. 4-4 (1/3) Setup Common Parameter Screen (TX Measure)

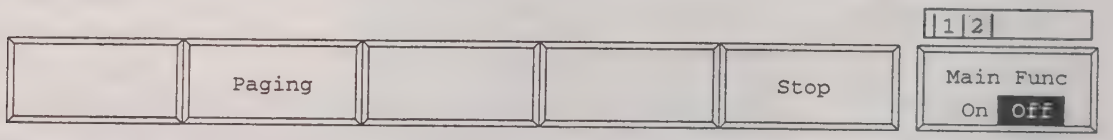
Note: RX Measure main function key (F2) and Output RF Spectrum function key (F11) do not appear when the Measuring Object is set to RACH.

- The 2nd page of the main function keys on the Setup Common Parameter screen (TX Measure)

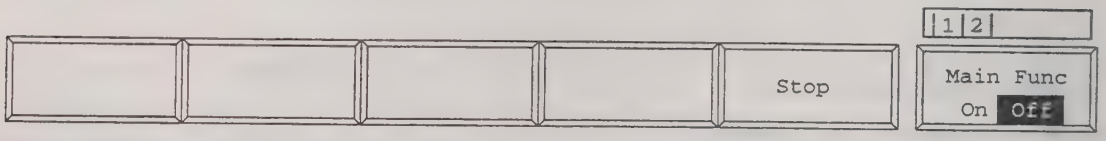
(1) When the RCA is the Call Processing status of Stop:



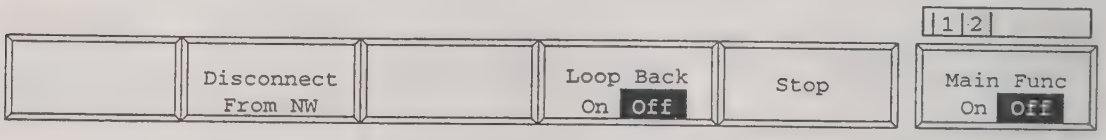

(2) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle:




(3) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Paging, Radio Link, Registration, Origination, Termination, Hand Over, Disc from MS or Radio Disc.




(4) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Communication:



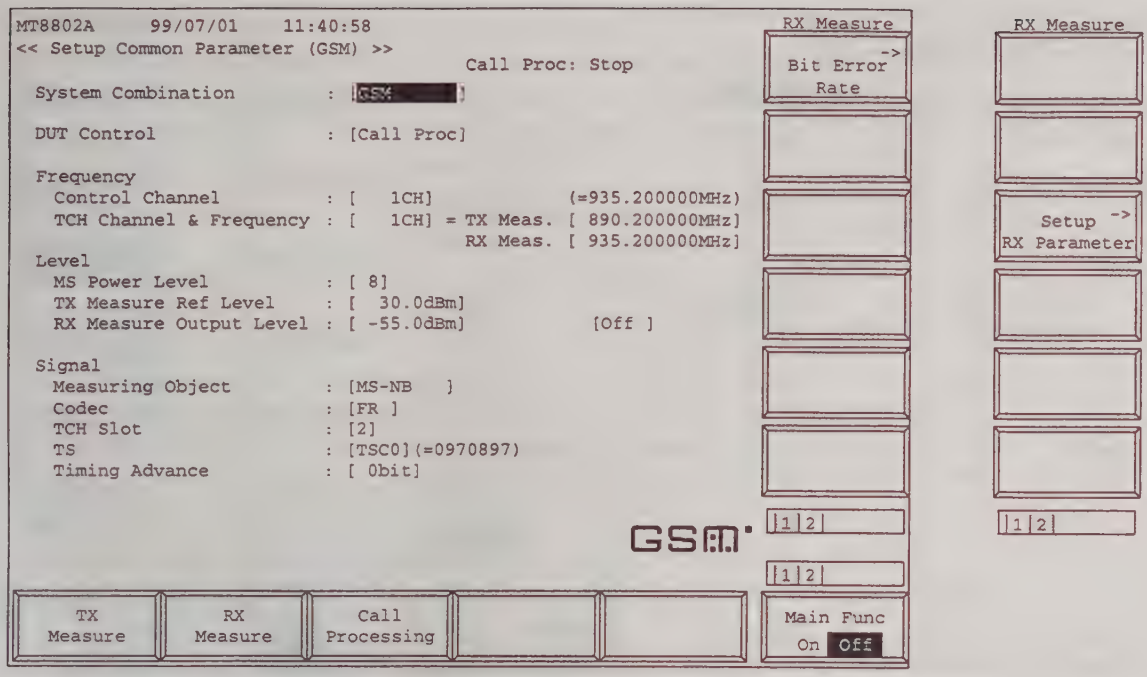



Fig. 4-4 (2/3) Setup Common Parameter Screen (RX Measure)

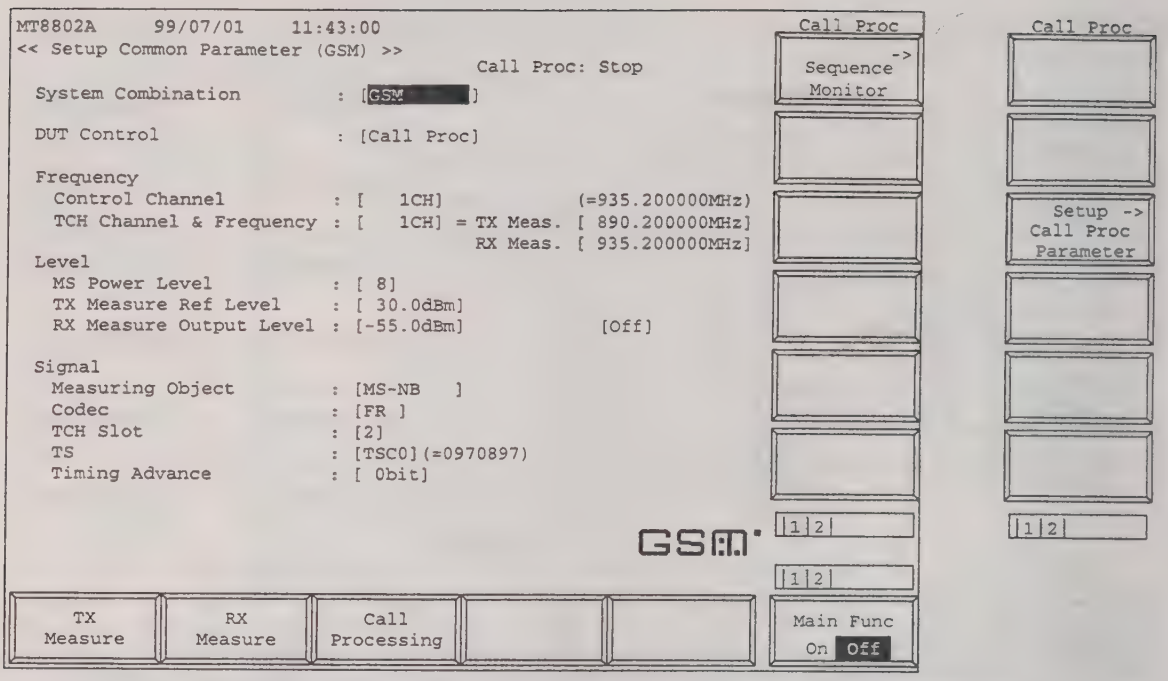
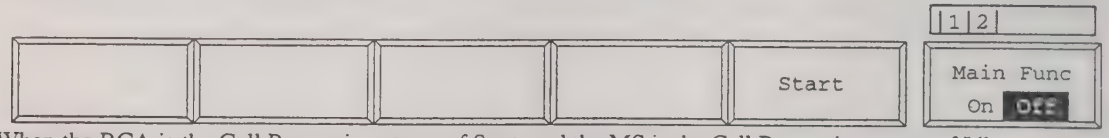


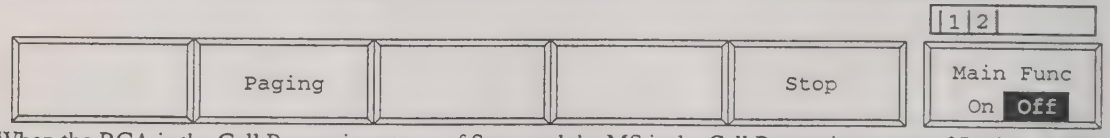

Fig. 4-4 (3/3) Setup Common Parameter Screen (Call Processing)

- The 2nd page of the main function keys on the Setup Common Parameter screen (Call Processing)

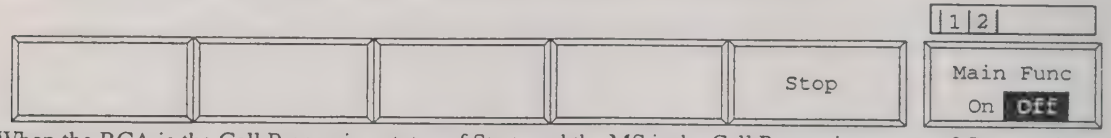
(1) When the RCA is the Call Processing status of Stop:



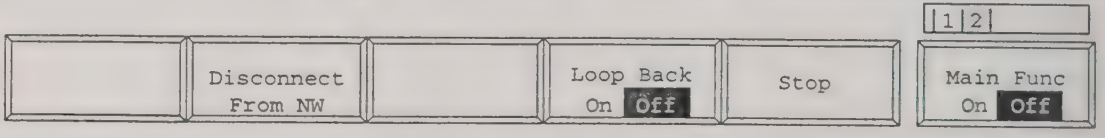

(2) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle:




(3) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Paging, Radio Link, Registration, Origination, Termination, Hand Over, Disc from MS or Radio Disc.




(4) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Communication:




Note: The setup items for Signal (Codec, TCH Slot, TS and Timing Advance) do not appear when the Measuring Object is set to CONTINUOUS or RACH.

• Set the following items:

| Item | Range | Initial value | |
|---|---|---|---|
| System Combination | GSM, GSM/DCS1800, GSM/PCS1900 | GSM | *7 |
| DUT Control | Call proc, None | None | |
| Channel & Frequency | | | |
| Control Channel | 0 to 9999 | 1 | |
| TCH Channel & Frequency | | | *1, *7 |
| TCH Channel | 0 to 9999 | 1 | |
| TX Meas. (Frequency) | 0.3 to 3000 MHz | 890.200 000 MHz | *1, *7 |
| RX Meas. (Frequency) | 0.3 to 3000 MHz | 935.200 000 MHz | *1, *7 |
| Level | | | |
| MS Power Level | 0 to 31 | 8 | *2 |
| TX Measure Ref Level | | | |
| (Main) | -10.0 to +42.0 dBm | +30.0 dBm | |
| (AUX) | -30.0 to +22.0 dBm | – | |
| RX Measure Output Level | | | |
| (Main) | -133.0 to -13.0 dBm | -55.0 dBm | |
| (AUX) | -133.0 to +7.0 dBm | – | |
| Signal | | | *4 |
| Measuring Object | MSNB, CONTINUOUS | MSNB | *1 |
| Codec | FR, EFR, HR0, HR1 | FR | *5 |
| TCH Slot | 0 to 7 | 0 | |
| TS | TSC0,TSC1,TSC2,TSC3, TSC4,TSC5,TSC6,TSC7 | TSC0 | *6 |
| Timing Advance | 0 to 63 bits | 0 bits | |

*1 When the DUT Control is set to Call Proc, the Measuring Object is MS-NB and the TX Measure Frequency and RX Measure Frequency is set to the values corresponding to the CH (channel). The TCH Slot can be set to a value between 2 and 6.

*2 The MS Power Level setting value and the output level (dBm) from the MS

*3 When the main function key [Stop]F5 is pressed to stop the RCA, the RX Measure Output Level is set to OFF.

Further, when the main function key [Start]F5 is pressed to set the RCA Call Processing to the Idle state, the RX Measure Output Level (set value when the RCA is in the Stop state) is actually output from the RCA.

*4 The setup items for Signal (Codec, TCH Slot, TS and Timing Advance) do not appear when the Measuring Object is set to CONTINUOUS or RACH.

*5 The abbreviations in the Codec (FR, EFR, HR0, HR1) are as follows.

FR (Full Rate)
EFR (Enhanced Full Rate)
HR0 (Half Rate subchannel 0)
HR1 (Half Rate subchannel 1)

| MS Power Level | Output Level from MS (dBm) | | |
|---|---|---|---|
| | GSM | DCS1800 | PCS1900 |
| 0 | – | 30 | 30 |
| 1 | – | 28 | 28 |
| 2 | 39 | 26 | 26 |
| 3 | 37 | 24 | 24 |
| 4 | 35 | 22 | 22 |
| 5 | 33 | 20 | 20 |
| 6 | 31 | 18 | 18 |
| 7 | 29 | 16 | 16 |
| 8 | 27 | 14 | 14 |
| 9 | 25 | 12 | 12 |
| 10 | 23 | 10 | 10 |
| 11 | 21 | 8 | 8 |
| 12 | 19 | 6 | 6 |
| 13 | 17 | 4 | 4 |
| 14 | 15 | 2 | 2 |
| 15 | 13 | 0 | 0 |
| 16 | 11 | – | – |
| 17 | 9 | – | – |
| 18 | 7 | – | – |
| 19 | 5 | – | – |
| 20 | – | – | – |
| 21 | – | – | – |
| 22 | – | – | – |
| 23 | – | – | – |
| 24 | – | – | – |
| 25 | – | – | – |
| 26 | – | – | – |
| 27 | – | – | – |
| 28 | – | – | – |
| 29 | – | 36 | – |
| 30 | – | 34 | – |
| 31 | – | 32 | – |

*6 The following shows the actual values for TSC0 to TSC7.

TSC0 0970897
TSC1 0B778B7
TSC2 10EE90E
TSC3 11ED11E
TSC4 06B906B
TSC5 13AC13A
TSC6 29F629F
TSC7 3BC4BBC

*7 Relationship between measurement frequencies and channels

| System Combination | Band | Channel (n) | TX Frequency[MHz] | RX Frequency[MHz] |
|---|---|---|---|---|
| GSM | P-GSM | 1 to 124 | 890+0.2×n | TX Frequency + 45 |
| GSM/DCS1800 | P-GSM,E-GSM | 0 to 124 | 890+0.2×n | TX Frequency + 45 |
| | R-GSM,GSM450 | 128 to 251 | 824.2+0.2×(n-128) | TX Frequency + 25 |
| | GSM480,GSM850 | 259 to 293 | 450.6+0.2×(n-259) | TX Frequency + 10 |
| | GSM1800 | 306 to 340 | 479+0.2×(n-306) | TX Frequency + 10 |
| | | 512 to 885 | 1710.2+0.2×(n-512) | TX Frequency + 95 |
| | | 955 to 1023 | 890+0.2×(n-1024) | TX Frequency + 45 |
| GSM/PCS1900 | P-GSM,E-GSM | 0 to 124 | 890+0.2×n | TX Frequency + 45 |
| | R-GSM,GSM850 | 128 to 251 | 824.2+0.2×(n-128) | TX Frequency + 25 |
| | GSM1900 | 512 to 810 | 1850.2+0.2×(n-512) | TX Frequency + 80 |
| | | 955 to 1023 | 890+0.2×(n-1024) | TX Frequency + 45 |

Note: On using RCA within GSM450 and the GSM480 BAND, set up an output level (RXOutputLevel) in less than -28 dBm.

The following shows the cases where the setup is enabled or disabled depending on the Call Processing status.

- List of settable items for each status

O: enabled X: disabled and opens error-message window.

| | DUT Control/None | DUT Control/Call proc MT8802A Stop | DUT Control/Call proc Status 0 | DUT Control/Call proc Status 1 | DUT Control/Call proc Status 2 |
|---|---|---|---|---|---|
| System Combination | O | O | X | X | X |
| DUT Control (Call proc/None) | O | O | O | O | O |
| Contrl Channel | O | O | O | X | X |
| TCH Channel | O | O | O | X | O |
| TCH TX Meas.Freq. | O | X | X | X | X |
| TCH RX Meas.Freq. | O | X | X | X | X |
| MS Power Level | O | O | O | X | O |
| TX Ref Level | O | O | O | X | O |
| RX Output Level | O | O | O | X | O |
| RX Level On/Off | O | X | X | X | X |
| Measuring Object | O | O | O | X | X |
| Codec | O | O | O | X | X |
| TCH Slot | O | O | O | X | O |
| TS | O | O | X | X | X |
| Timing Advance | O | O | O | X | O |

status0 = Idle

status1 = Paging, RadioLink, Registration, Origination, Termination, Hand Over, Disc from NT, Disk from MS, Radio Disc

status2 = Communication

- 1st Page of main function keys

[TX Measure]F1 Displays the TX Measure (for transmitter test) function keys for F1 to F12.

[RX Measure]F2 Displays the RX Measure (for receiver test) function keys for F1 to F12.

[Call Processing]F3 Displays the Call Processing (for call-processing sequence monitor) function keys for F1 to F12.

- 2nd Page of TX Measure main function keys

| | |
|---|---|
| [Paging]F2 | Pages the MS. |
| [Disconnect from NT]F2 | Disconnects the MS from network side (RCA). |
| [Loop Back On Off]F4 | Turns on/off the MS loop-back state. |
| [Start]F5 | Changes the RCA from Stop state to Start state. |
| [Stop]F5 | Changes the RCA from Start state to Stop state. |

- 2nd Page of Call Processing main function keys

| | |
|---|---|
| [Paging]F2 | Pages the MS. |
| [Disconnect from NT]F2 | Disconnects the MS from network side (RCA). |
| [Loop Back On Off]F4 | Turns on/off the MS loop-back state. |
| [Start]F5 | Changes the RCA from Stop state to Start state. |
| [Stop]F5 | Changes the RCA from Start state to Stop state. |

- TX Measure function keys

1st page

| | |
|---|---|
| [All Measure→]F7 | Displays the All Measure screen. |
| [Modulation Analysis→]F8 | Displays the Modulation Analysis screen. |
| [RF Power→]F9 | Displays the RF Power screen. |
| [Output RF Spectrum→]F11 | Displays the Output RF Spectrum screen. |
| [Power Meter→]F12 | Displays the Power Meter screen. |

2nd page

| | |
|---|---|
| [Select All Measure Item→]F7 | Displays the Select All Measure Item screen. |
| [Setup TX Parameter→]F9 | Displays the Setup TX Parameter screen. |

- RX Measure function keys

1st page

| | |
|---|---|
| [Bit Error Rate→]F7 | Displays the Bit Error Rate screen. |

2nd page

| | |
|---|---|
| [Setup RX Parameter→]F9 | Displays the Setup RX Parameter screen. |

- Call Processing function keys

1st page

| | |
|---|---|
| [Sequence Monitor→]F7 | Displays the Sequence Monitor screen. |

2nd page

| | |
|---|---|
| [Setup Call Proc Parameter→]F9 | Displays the Setup Call Processing Parameter screen. |

## 4.3.6 Transmitter test: TX Measure mode

This paragraph describes the following transmitter test items:

1. Setting parameters (Setup TX Measure Parameter screen) and all item measurement (All Measure screen) items (Select All Measure Item screen)
2. All item measurement (All Measure screen)
3. Modulation analysis [1] (Modulation Analysis screen: Value display)
   Modulation analysis [2] (Constellation screen, Eye Diagram screen, Phase Error screen, Magnitude Error screen: Waveform display of 4 screens)
4. TX RF power (burst amplitude) measurement (RF Power screen, Setup Template screen)
5. RF output spectrum measurement (Output RF Spectrum screen)
6. TX RF power (average) measurement (Power Meter screen)

### (1) Setting the parameters: Setup TX Measure Parameter screen

This paragraph describes how to set parameters (Setup TX Measure Parameter screen) to conduct the transmitter test (TX Measure mode).

(a) Setting the parameters: Setup TX Measure Parameter screen

• Switch to the Setup TX Measure Parameter screen according to the following steps:

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets the TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | Next Menu [▲] | Displays the second page of the TX Measure menu. |
| 5. | [Setup TX Parameter]F9 | Displays the Setup TX Measure Parameter screen. |

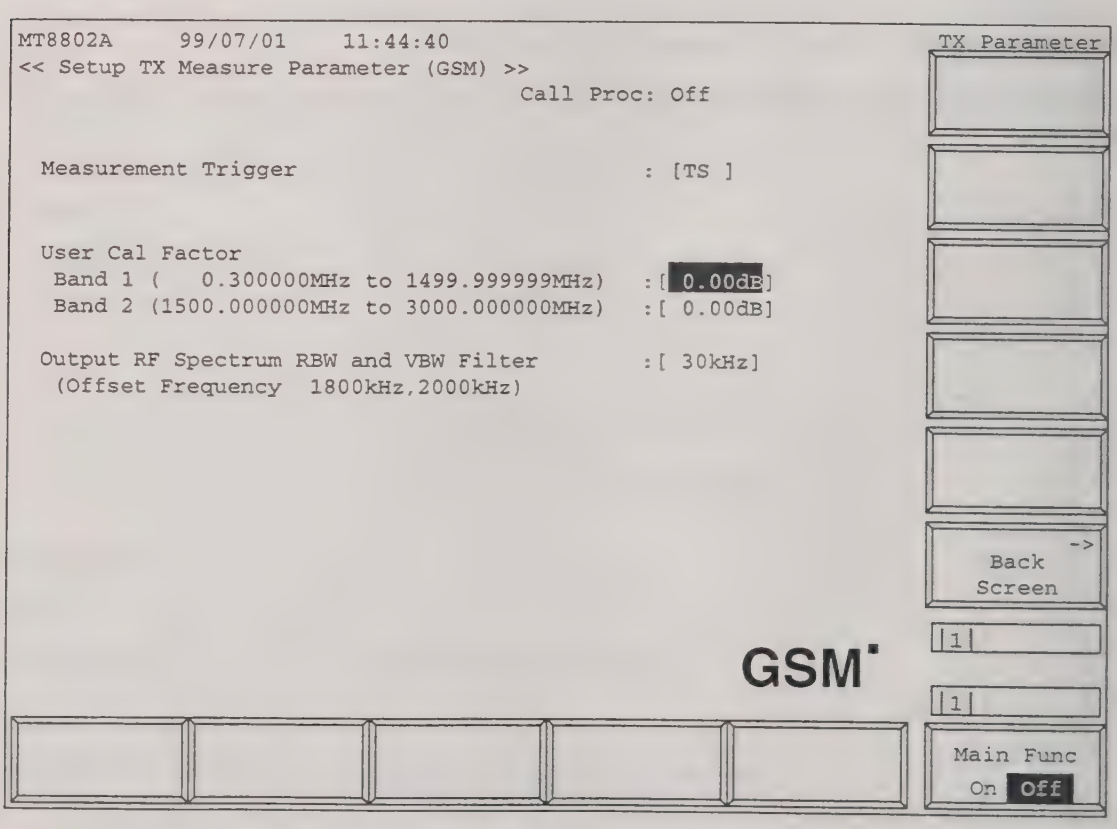



Fig. 4-5 Setup TX Measure Parameter Screen

Note: The setup item of Measurement Trigger does not appear when the DUT Control is set to Call Proc.

• Set the following items:

| Item | Range | Resolution | Initial value | |
|---|---|---|---|---|
| Measurement Trigger | | | | |
| | TS, VIDEO | | TS | |
| User Cal Factor (User-level calibration value) | | | | |
| Band 1 (0.3 MHz to 1499.999999 MHz) | | | | |
| | -30.00 to 30.00 dB | 0.01 dB | 0.00 dB | (*1) |
| Band 2 (500 MHz to 3000 MHz) | | | | |
| | -30.00 to 30.00 dB | 0.01 dB | 0.00 dB | (*1) |
| Output RF Spectrum RBW and VBW Filter (Offset Frequency 1800 KHz, 2000 KHz) | | | | |
| | 30 kHz, 100 kHz | | 30 kHz | |

*1 The value obtained from the following equation is displayed as an RF level measurement result:
Displayed measurement result value = Measured value + User Cal Factor
For User Cal Factor, the loss in the RF cable connecting the MT8802A and device under test is set as a correction value.(See paragraph 4.3.1, (2))

• Function keys

| | |
|---|---|
| Main function key: | None |
| Function key: | TX Parameter |
| [Back Screen] (F12): | Displays the previous screen. |

(b) Setting items for all item measurement of the transmitter: Select All Measure Item screen

- Switch to the Select All Measure Item screen according the following steps:

Set all item measurement (All Measure screen) items on this screen.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | Next Menu [▲] | Displays the second page of the TX Measure menu. |
| 5. | [Select All Measure Item]F7 | Displays the first page of the Select All Measure Item screen. |
| 6. | [Next Page]F8 | Displays the second page of the Select All Measure Item screen. |

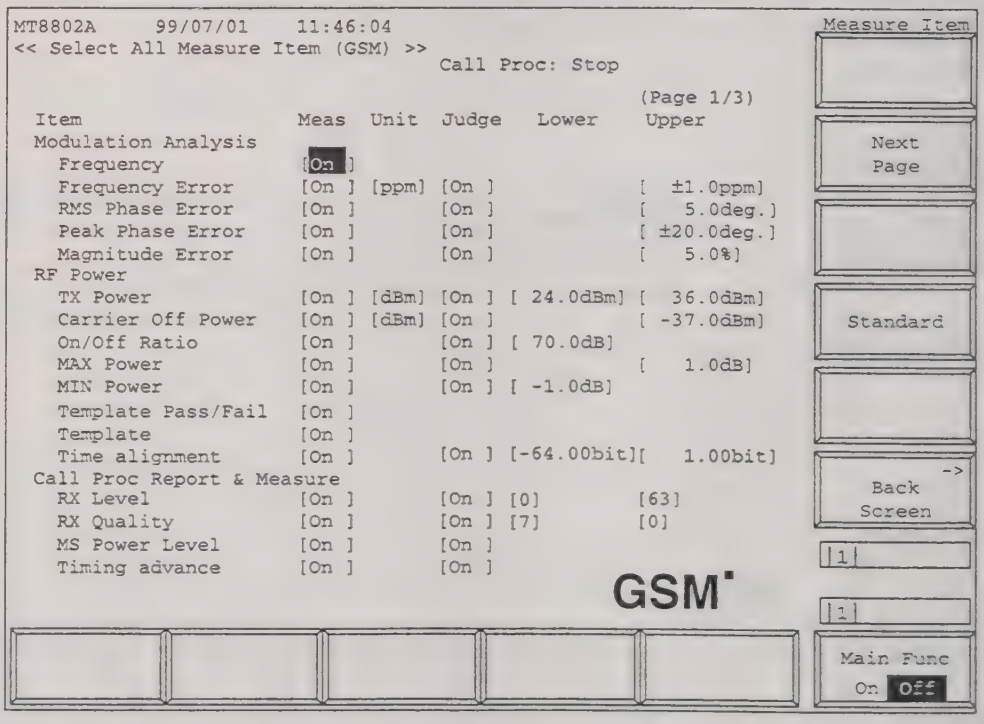

MT8802A 99/07/01 11:46:04
<< Select All Measure Item (GSM) >>
Call Proc: Stop
(Page 1/3)
Item Meas Unit Judge Lower Upper
Modulation Analysis
Frequency [On ]
Frequency Error [On ] [ppm] [On ] [ ±1.0ppm]
RMS Phase Error [On ] [On ] [ 5.0deg.]
Peak Phase Error [On ] [On ] [ ±20.0deg.]
Magnitude Error [On ] [On ] [ 5.0%]
RF Power
TX Power [On ] [dBm] [On ] [ 24.0dBm] [ 36.0dBm]
Carrier Off Power [On ] [dBm] [On ] [ -37.0dBm]
On/Off Ratio [On ] [On ] [ 70.0dB]
MAX Power [On ] [On ] [ 1.0dB]
MIN Power [On ] [On ] [ -1.0dB]
Template Pass/Fail [On ]
Template [On ]
Time alignment [On ] [On ] [-64.00bit][ 1.00bit]
Call Proc Report & Measure
RX Level [On ] [On ] [0] [63]
RX Quality [On ] [On ] [7] [0]
MS Power Level [On ] [On ]
Timing advance [On ] [On ]
GSM
Measure Item
Next Page
Standard
->
Back Screen
Main Func On Off

Fig. 4-6 Select All Measure Item Screen (First Page)

Note: The setup items of Call Proc Report & Measure (RX Level, RX Quality and Timing Advance) do not appear when the Call Proc is set to None.

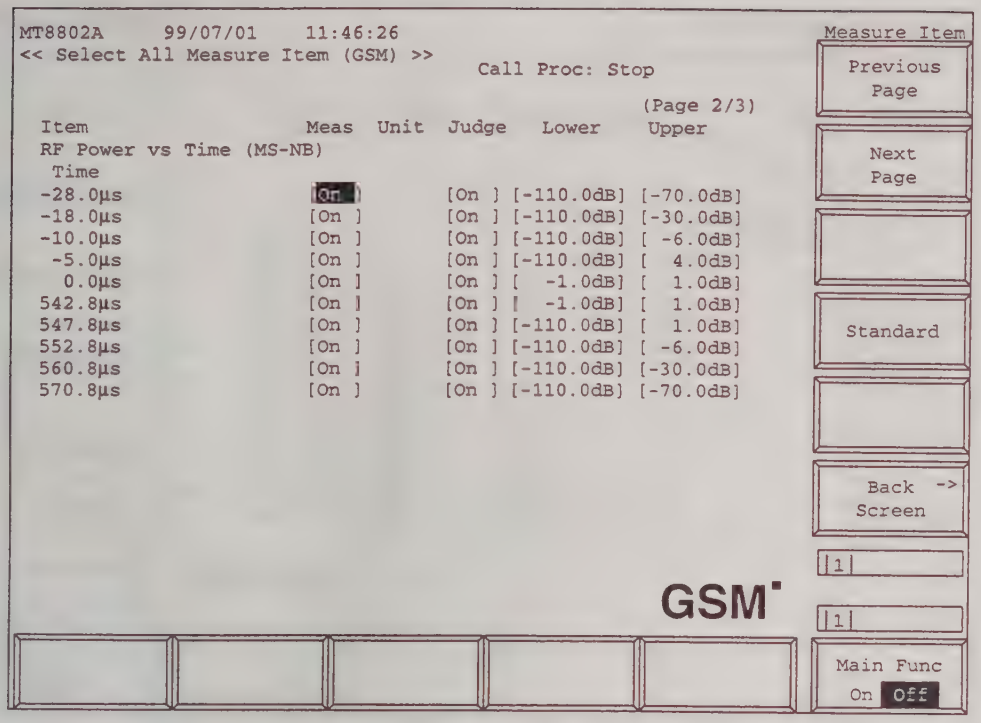

MT8802A 99/07/01 11:46:26
<< Select All Measure Item (GSM) >>
Call Proc: Stop
(Page 2/3)
Item Meas Unit Judge Lower Upper
RF Power vs Time (MS-NB)
Time
-28.0µs [On ] [On ] [-110.0dB] [-70.0dB]
-18.0µs [On ] [On ] [-110.0dB] [-30.0dB]
-10.0µs [On ] [On ] [-110.0dB] [ -6.0dB]
-5.0µs [On ] [On ] [-110.0dB] [ 4.0dB]
0.0µs [On ] [On ] [ -1.0dB] [ 1.0dB]
542.8µs [On ] [On ] [ -1.0dB] [ 1.0dB]
547.8µs [On ] [On ] [-110.0dB] [ 1.0dB]
552.8µs [On ] [On ] [-110.0dB] [ -6.0dB]
560.8µs [On ] [On ] [-110.0dB] [-30.0dB]
570.8µs [On ] [On ] [-110.0dB] [-70.0dB]
GSM
Measure Item
Previous Page
Next Page
Standard
Back -> Screen
Main Func
On Off

Fig. 4-7 Select All Measure Item Screen (Second Page)

Note: The values of item are changed when the Measuring Object is set to RACH.

542.8 µs → 321.2 µs
547.8 µs → 326.2 µs
552.8 µs → 331.2 µs
560.8 µs → 339.2 µs
570.8 µs → 349.2 µs

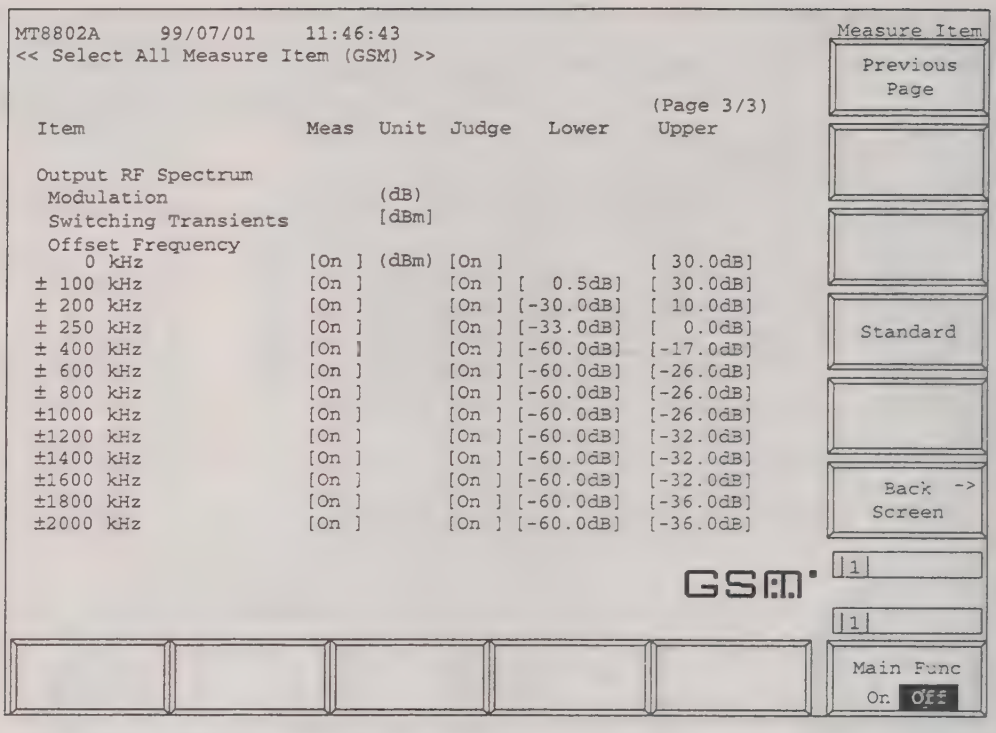

MT8802A 99/07/01 11:46:43
<< Select All Measure Item (GSM) >>
(Page 3/3)
Item Meas Unit Judge Lower Upper
Output RF Spectrum
Modulation (dB)
Switching Transients [dBm]
Offset Frequency
0 kHz [On ] (dBm) [On ] [ 30.0dB]
± 100 kHz [On ] [On ] [ 0.5dB] [ 30.0dB]
± 200 kHz [On ] [On ] [-30.0dB] [ 10.0dB]
± 250 kHz [On ] [On ] [-33.0dB] [ 0.0dB]
± 400 kHz [On ] [On ] [-60.0dB] [-17.0dB]
± 600 kHz [On ] [On ] [-60.0dB] [-26.0dB]
± 800 kHz [On ] [On ] [-60.0dB] [-26.0dB]
±1000 kHz [On ] [On ] [-60.0dB] [-26.0dB]
±1200 kHz [On ] [On ] [-60.0dB] [-32.0dB]
±1400 kHz [On ] [On ] [-60.0dB] [-32.0dB]
±1600 kHz [On ] [On ] [-60.0dB] [-32.0dB]
±1800 kHz [On ] [On ] [-60.0dB] [-36.0dB]
±2000 kHz [On ] [On ] [-60.0dB] [-36.0dB]
GSM
Measure Item
Previous Page
Standard
Back -> Screen
1
1
Main Func
On Off

Fig. 4-8 Select All Measure Item Screen (Third Page)

Notes:
- f the unit of Upper (Switch) is set to dB, the indications of Meas, Judge and Upper(Switch) at 0-kHz Offset Frequency do not appear (non-definable).
- Select All Measure Item screen (Third Page) do not appear when the Measuring Object is set to RACH.

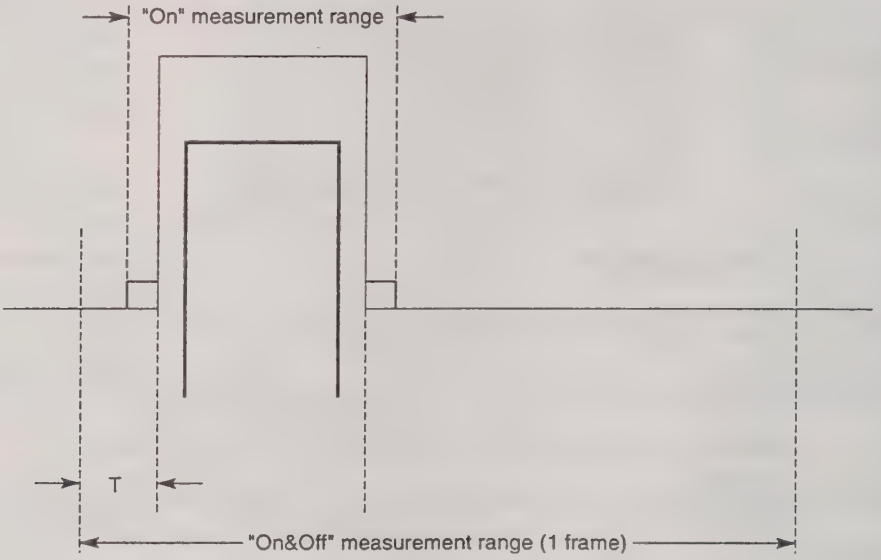
• Set items in the following ranges: (* indicates the initial value.)

| Item | Measurement On/Off | Unit (*1) | Judge On/Off | Lower lower limit value | Upper upper limit value |
|---|---|---|---|---|---|
| 1st page | | | | | |
| Modulation Analysis | | | | | |
| Frequency | On*, Off | (MHz) | | | |
| Frequency Error | On*, Off | kHz,ppm* | On*, Off | | ±0.000 to 100.000 kHz(Unit: kHz) (* 2) |
| | | | | | ±0.0 to 100.0 ppm, 0.1 ppm*(Unit: ppm) |
| RMS Phase Error | On*, Off | (deg) | On*, Off | | 0.0 to 100.0 deg., 5.0 deg.* |
| Peak Phase Error | On*, Off | (deg) | On*, Off | | ±0.0 to 100.0 deg., ±20.0 deg.* |
| Magnitude Error | On*, Off | (%) | On*, Off | | 0.0 to 100.0 %, 5.0 %* |
| RF Power | | | | | |
| TX Power | On*, Off | DBM*,WATT | On*, Off | 0 to 20,(Unit: WATT) | 0 to 20(Unit: WATT) |
| | | | | -80.0 to 43.0, 24.0*(Unit: DBM) | -80.0 to 43.0, 36.0*(Unit: DBM) |
| Carrier Off Power | On*, Off | DBM*,WATT | On*, Off | | 0 to 20, (Unit: WATT) |
| | | | | | -80.0 to 43.0, -37.0*(Unit: DBM) |
| On/Off Ratio | On*, Off | (dB) | On*, Off | 0 to 100 dB, 70* | |
| MAX Power | On*, Off | | On, Off | | 0.0 to 10.0 dB, 1.0 dB* |
| MIN Power | On*, Off | | On, Off | -110.0 dB to 0.0 dB, -1.0 dB* | |
| Template Pass/Fail | On*, Off | | | | |
| Template | On*, On&Off | | | | |
| Time Alignment | On*, Off | On*, Off | | -64.00 to 1.00 bit, -64* | -64.00 to 1.00 bit, 1.00* |
| Call Processing Report & Measure | | | | | |
| RX Level | On*, Off | | On*, Off | 0* | 63* |
| RX Quality | On*, Off | | On*, Off | 0 to 7, 7* | 0 to 7, 0* |
| MS Power Level | On, Off | | On, Off | | |
| Timing Advance | On*, Off* | | | | |
| 2nd page | | | | | |
| RF Power vs Time(MS-NB) | On*, Off | | On*, Off | -110.00 dB to 10.00 dB, | -110.00 dB to 10.00 dB (*4) |
| | | | | (-28.0 us:-110 dB* | -70.0 dB*) |
| | | | | (-18.0 us:-110 dB* | -30.0 dB*) |
| | | | | (-10.0 us:-110 dB* | -6.0 dB*) |
| | | | | (-5.0 us: -110 dB* | 4.0 dB*) |
| | | | | (-0.0 us: -1.0 dB* | 1.0 dB*) |
| | | | | (542.8 us:-110 dB* | 1.0 dB*) |
| | | | | (547.8 us:-110 dB* | 1.0 dB*) |
| | | | | (552.8 us:-110 dB* | -6.0 dB*) |
| | | | | (560.8 us:-110 dB* | -30.0 dB*) |
| | | | | (570.8 us:-110 dB* | -70.0 dB*) |

*1 Values in parentheses are fixed units.

*2 The set judgment upper limit value is considered both the upper and lower limit values. (Judgment is made using the absolute value of an error from the reference value.)

*3 Template On: A signal waveform is applied to measurement only in a section with a burst.
Template On&Off: A signal waveform is applied to measurement in both sections with and without a burst. (See the figure below.)




*4 The values of RFPower vs Time are changed as follows when the Measuring Object is set to RACH.

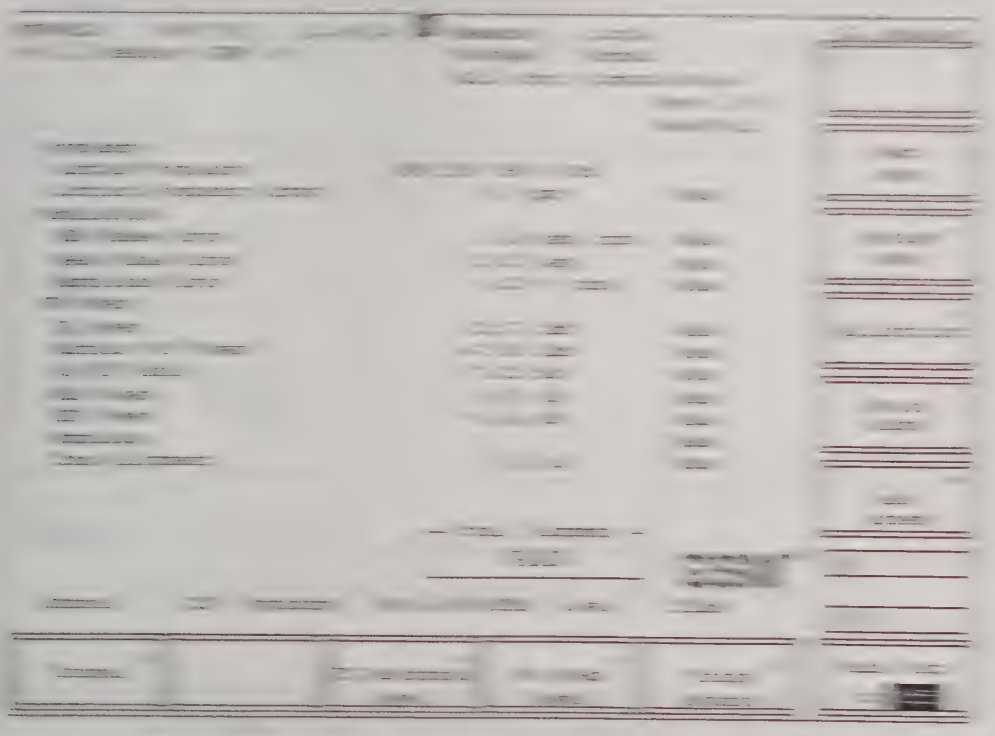
542.8 µs → 321.2 µs
547.8 µs → 326.2 µs
552.8 µs → 331.2 µs
560.8 µs → 339.2 µs
570.8 µs → 349.2 µs

(Cont.)

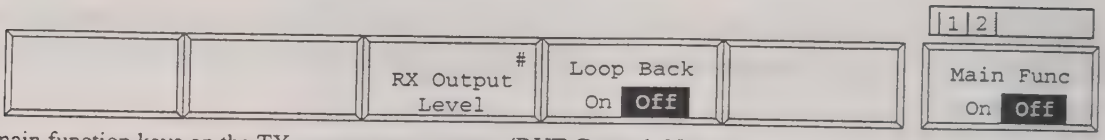
| Item | Measurement On/Off | Unit (Note1) | Judge On/Off | Lower lower limit value | Upper upper limit value |
|---|---|---|---|---|---|
| 3rd page | | | | | |
| Output RF Spectrum | On*, Off | | On*, Off | -100 to 10 dB | -100 to 10 dB |
| | | | | | -100 to 40 dBm |
| | | | | | --Switching Transients:dB-- |
| | | | | (+/-100 kHz: 0.5 dB*) | (+/-100 kHz: 0.5 dB*) |
| | | | | (+/-200 kHz: -30.0 dB*) | (+/-200 kHz: -30.0 dB*) |
| | | | | (+/-250 kHz: -33 dB*) | (+/-250 kHz: -33 dB*) |
| | | | | (+/-400 kHz to 2000 kHz : -60 dB*) | (+/-400 kHz to 2000 kHz : -60 dB*) |
| | | | | | --Switching Transients:dBm-- |
| | | | | | (+/-100 kHz: 30.0 dBm*) |
| | | | | | (+/-200 kHz: 10.0 dBm*) |
| | | | | | (+/-250 kHz: 0.0 dBm*) |
| | | | | | (+/-400 kHz: -17 dBm*) |
| | | | | | (+/-600 to 1000 kHz: -26 dBm*) |
| | | | | | (+/-1200 to 1600 kHz: -32 dBm*) |
| | | | | | (+/-1800 to 2000 kHz: -36 dBm*) |

Notes: If the unit of the Upper(Switch) is set to dB, the indications of Meas, Judge and Upper(Switch) at 0-kHz Offset Frequency do not appear (non-definable).

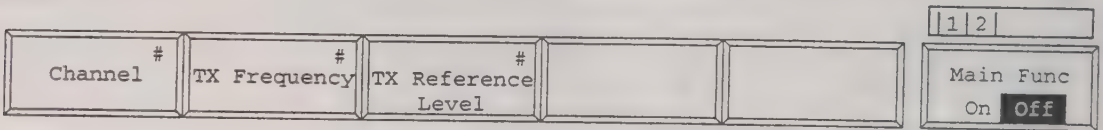
- When the [Standard] F10 function key is pressed, items in the all measurement value list (All Measure screen) are set to the initial values.
- Third Page (Output RF Spectrum) do not appear when the Measuring Object is set to RACH.

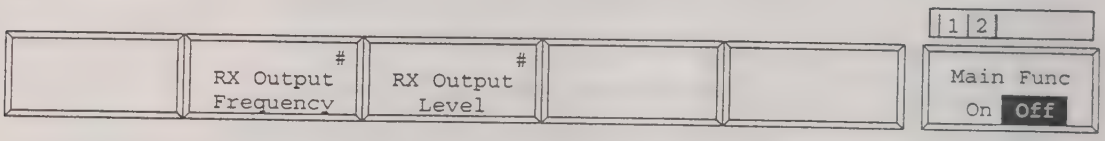


The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)



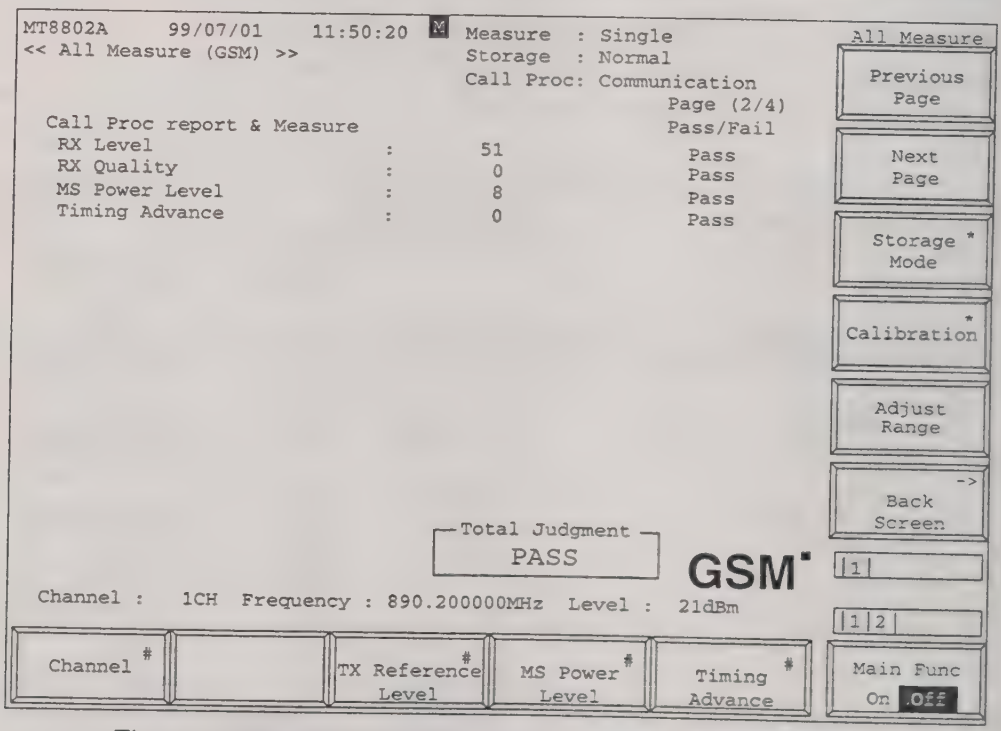




Fig. 4-10 Example of All Measure screen (Second Page)

Notes:
- The setup items of Call Proc Report & Measure (RX Level, RX Quality, Timing Advance and Time Alignment) do not appear when the DUT Control is set to None.
- This Second Page do not appear when the Measuring Object is set to RACH.

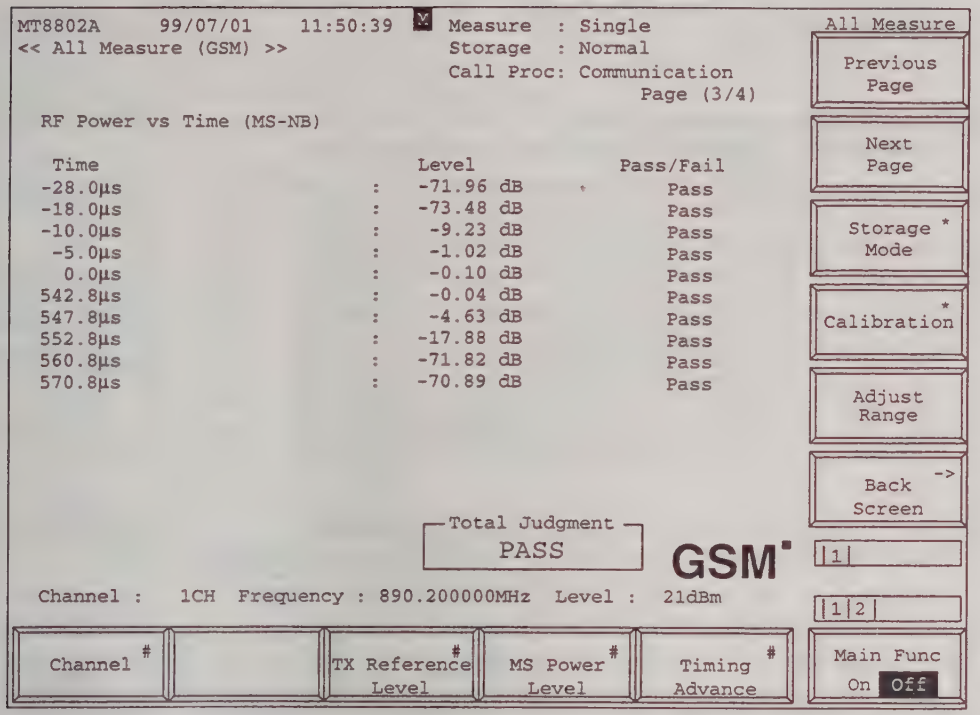



Fig. 4-11 Example of All Measure screen (Third Page)

Note: The values of RFPower vs Time are changed as follows when the Measuring Object is set to RACH.

542.8 µs → 321.2 µs
547.8 µs → 326.2 µs
552.8 µs → 331.2 µs
560.8 µs → 339.2 µs
570.8 µs → 349.2 µs

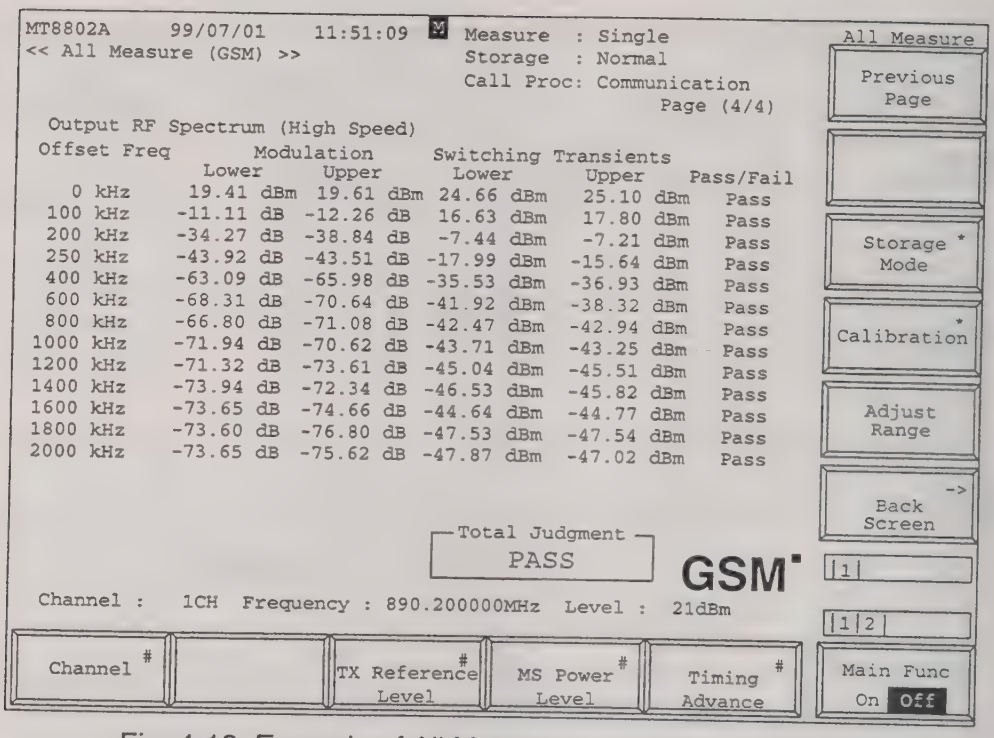

MT8802A 99/07/01 11:51:09 M
<< All Measure (GSM) >>
Measure : Single
Storage : Normal
Call Proc: Communication
Page (4/4)
All Measure
Previous Page
Storage * Mode
Calibration *
Adjust Range
Back Screen ->
Output RF Spectrum (High Speed)
Offset Freq Modulation Switching Transients
Lower Upper Lower Upper Pass/Fail
0 kHz 19.41 dBm 19.61 dBm 24.66 dBm 25.10 dBm Pass
100 kHz -11.11 dB -12.26 dB 16.63 dBm 17.80 dBm Pass
200 kHz -34.27 dB -38.84 dB -7.44 dBm -7.21 dBm Pass
250 kHz -43.92 dB -43.51 dB -17.99 dBm -15.64 dBm Pass
400 kHz -63.09 dB -65.98 dB -35.53 dBm -36.93 dBm Pass
600 kHz -68.31 dB -70.64 dB -41.92 dBm -38.32 dBm Pass
800 kHz -66.80 dB -71.08 dB -42.47 dBm -42.94 dBm Pass
1000 kHz -71.94 dB -70.62 dB -43.71 dBm -43.25 dBm Pass
1200 kHz -71.32 dB -73.61 dB -45.04 dBm -45.51 dBm Pass
1400 kHz -73.94 dB -72.34 dB -46.53 dBm -45.82 dBm Pass
1600 kHz -73.65 dB -74.66 dB -44.64 dBm -44.77 dBm Pass
1800 kHz -73.60 dB -76.80 dB -47.53 dBm -47.54 dBm Pass
2000 kHz -73.65 dB -75.62 dB -47.87 dBm -47.02 dBm Pass
Total Judgment
PASS
GSM
Channel : 1CH Frequency : 890.200000MHz Level : 21dBm
|1|
|1|2|
Channel #
TX Reference Level #
MS Power Level #
Timing Advance #
Main Func
On Off

Fig. 4-12 Example of All Measure screen (Fourth Page)

Notes:
- The Pass/Fail result at 0 kHz is displayed when the unit of Switching Transients is set to dBm.
- This Fourth Page do not appear when the Measuring Object is set to RACH.

- Main Function keys

1st page

[Channel]F1
Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2
Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3
Changes the RCA reference level to measure the transmission level from MS.

[MS Power Level]F4
Changes the transmission level from MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

[Timing Advance]F5
Changes Time Advance of MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

2nd page

[RX Output Frequency]F2
Changes the reception frequency of MS (output frequency from the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3
Changes the reception level of MS (output level from the RCA).

[Loop Back On Off]F4
Turns the loop-back state of MS on or off.
Disappeared when DUT Control is None.

- Function keys: All Measure

[Previous Page]F7
Displays the previous page.

[Next Page]F8
Displays the next page.

[Storage Mode]F9:
Displays the storage mode setup menu.

[Normal]F7:
Sets normal mode. (Initial value)

[Average]F8:
Sets averaging mode.

Measure mode is set to Single. (No screen is displayed.)

[Average Count]F9:
Sets an averaging count.

2 to 9999 (Initial value: 10)

[Refresh Interval]F10:
Sets the update time of the averaged-measurement data display.
Every: after every single measurement
Once: after the specified-count-measurement averaging processing

[return]F12:
Returns to the previous menu.

[Calibration]F10:
Displays the level calibration menu.

[Manual Calibration]F7:
Performs level calibration.

During calibration, the window indicating calibration in progress is displayed on the screen.

[Calibration Cancel]F8:
Deletes level calibration data.

[return]F12:
Returns to the previous menu.

[Adjust Range]F11:
Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal.(See paragraph 4.3.1(2))

[Back Screen]F12:
Displays the previous screen.

(3) Modulation analysis: Modulation Analysis screen (value display)Constellation screen, Eye Diagram screen, Phase Error screen, Magnitude Error screen (waveform display: 4 screens)

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to analyze a modulated signal from the transmitter, and display a measured value or waveform.

There is one value-display screen. A waveform display screen can be used to select and display one of five measured waveforms (Constellation, Eye Diagram, Vector Error, Phase Error, or Magnitude Error).

(a) Modulation analysis (value display): Modulation Analysis screen

• Display the Modulation Analysis screen according to the following steps:

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&TR Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [Modulation Analysis]F8 | Displays the Modulation Analysis screen. |

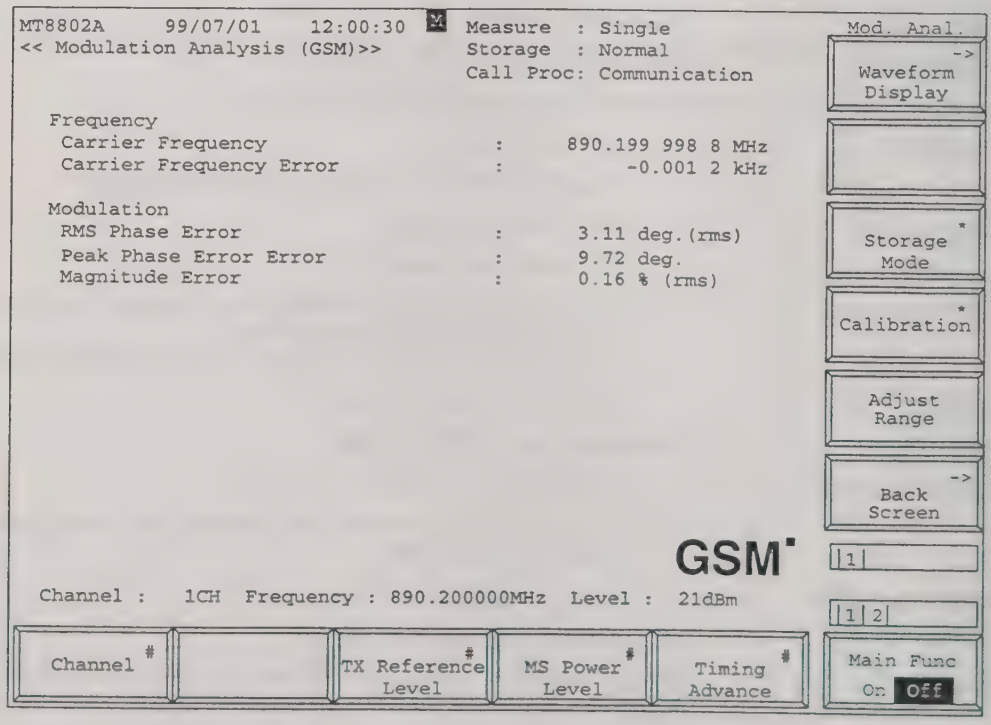
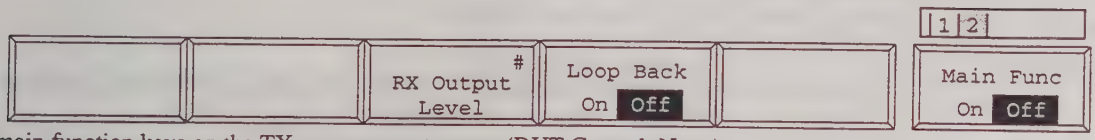
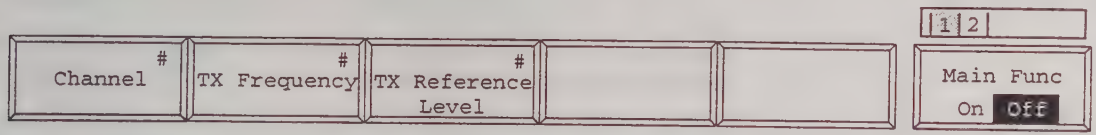



Fig. 4-13 Modulation Analysis Screen

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)



- Main Function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the RCA reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

[Timing Advance]F5 — Changes Time Advance of MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

2nd page

[RX Output Frequency]F2 — Changes the reception frequency of MS (output frequency from the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3 — Changes the reception level of MS (output level from the RCA).

[Loop Back On Off]F4 — Turns the loop-back state of MS on or off.
Disappeared when DUT Control is None.

- Function keys: — Mod.Anal.

[Waveform Display]F7: — Displays the Waveform Display screen.
(See paragraph 4.3.6, (3), (b).)

[Storage Mode]F9: — Displays the storage mode setup menu.

- [Normal]F7: — Sets normal mode (initial value).
- [Average]F8: — Sets averaging mode.
  Measure mode is set to Single.
- [Average Count]F9: — Sets an averaging count.
  2 to 9999 (Initial value: 10)
- [Refresh Interval]F10: — Sets the update time of the averaged-measurement data display.
  Every: after every single measurement
  Once: after the specified-count-measurement averaging processing
- [return]F12: — Returns to the previous menu.

[Calibration]F10: — Displays the level calibration menu.

- [Manual Calibration]F7: — Performs level calibration.
  During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: — Deletes level calibration data.
- [return]F12: — Returns to the previous menu.

[Adjust Range]F11: — Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1(2))

[Back Screen]F12: — Displays the previous screen.

(b) Modulation analysis (waveform display): Constellation screen, Eye Diagram screen, Phase Error screen, Magnitude Error screen

- Display the following four Waveform Display screens according to the steps described below:

Constellation: I to Q constellation
Eye Diagram: Symbol to I and Symbol to Q eye patterns
Phase Error: Symbol to phase error
Magnitude Error: Symbol to magnitude error

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [Modulation Analysis]F8 | Displays the Modulation Analysis screen. |
| 5. | [Waveform Display]F7 | Displays the Waveform Display screen (initial value: Constellation). |
| 6. | [Constellation] F7 | Displays the Constellation screen. |
| | [Eye Diagram] F8 | Displays the Eye Diagram screen. |
| | [Phase Error] F10 | Displays the Phase Error screen. |
| | [Magnitude Error]F11 | Displays the Magnitude Error screen. |

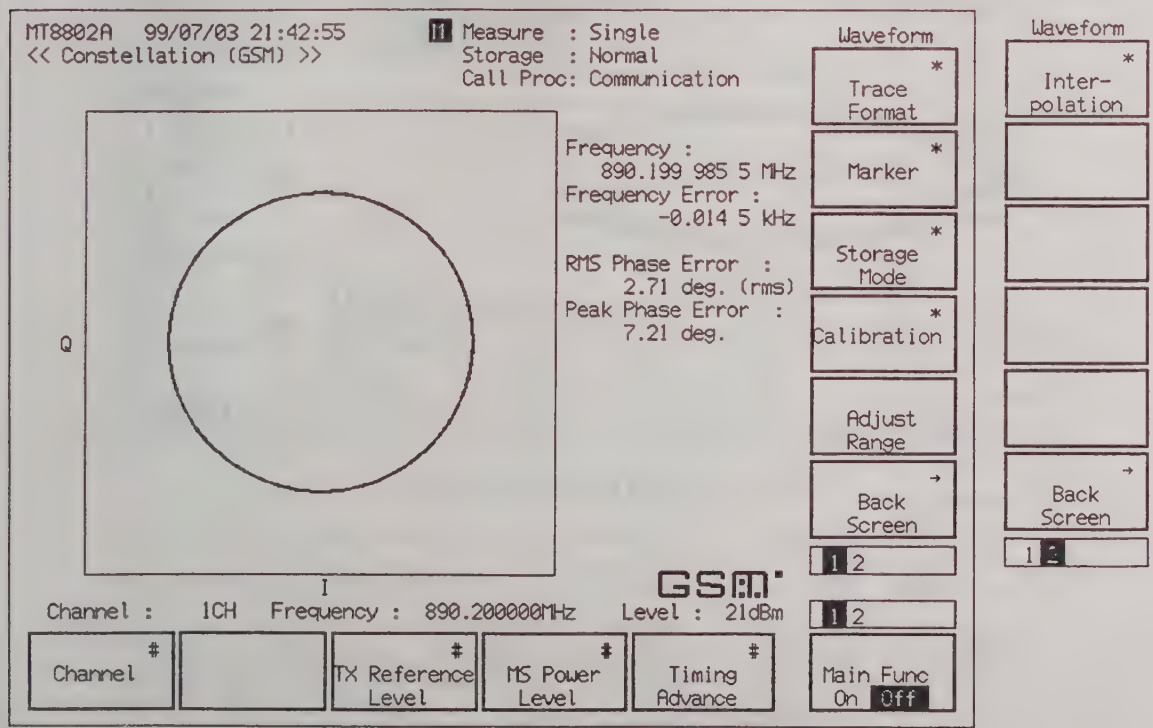
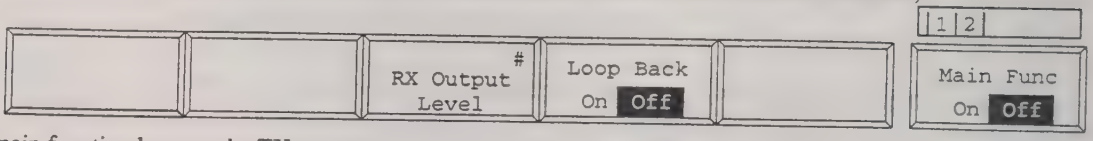
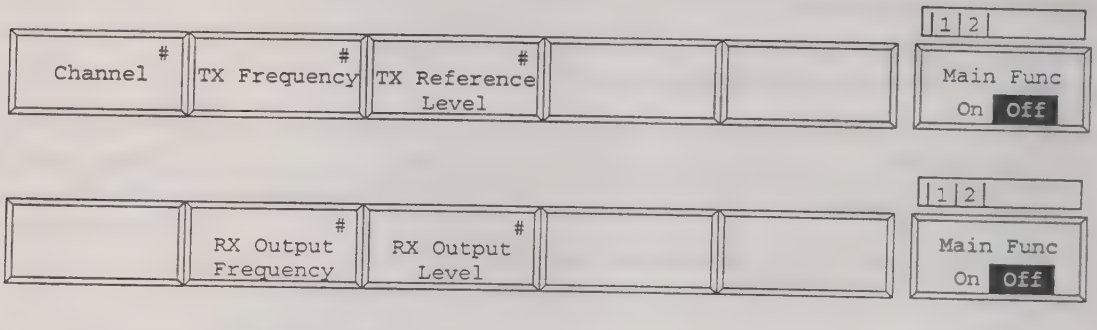



Fig. 4-14 Constellation Screen

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)



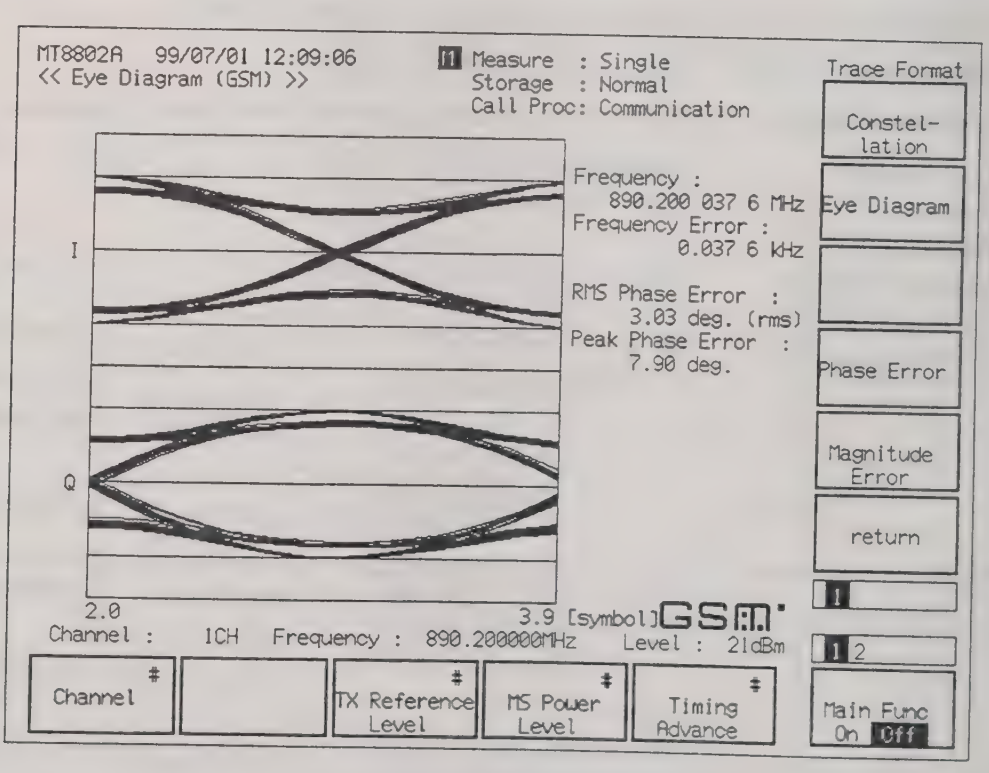




Fig. 4-15 Eye Diagram Screen

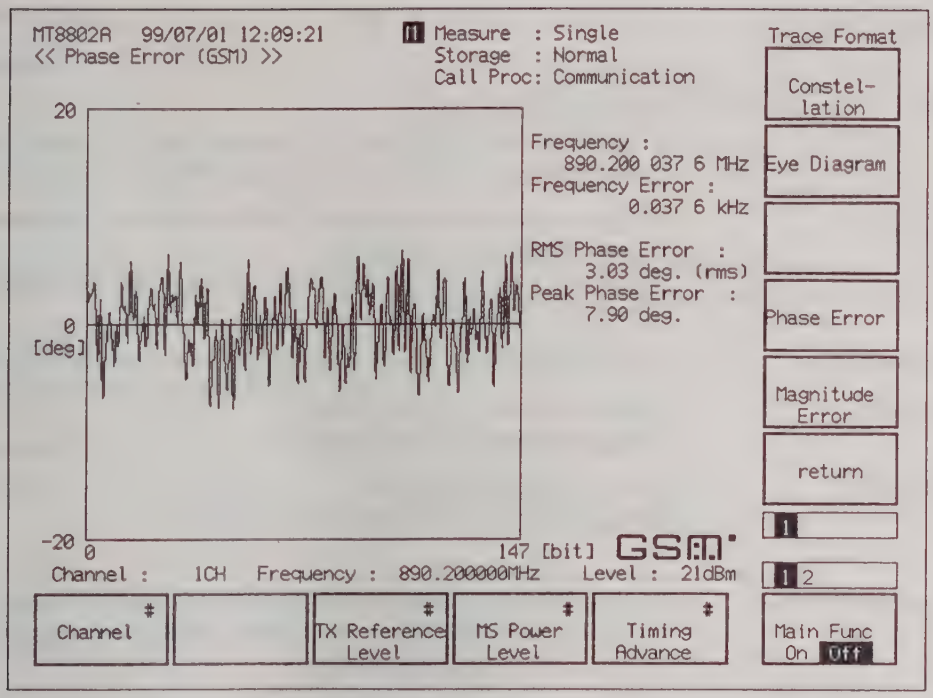



Fig. 4-16 Phase Error Screen

Note: The range of horizontal axis is changed to (0 to 87 bit) when the Measuring Object is set to RACH.

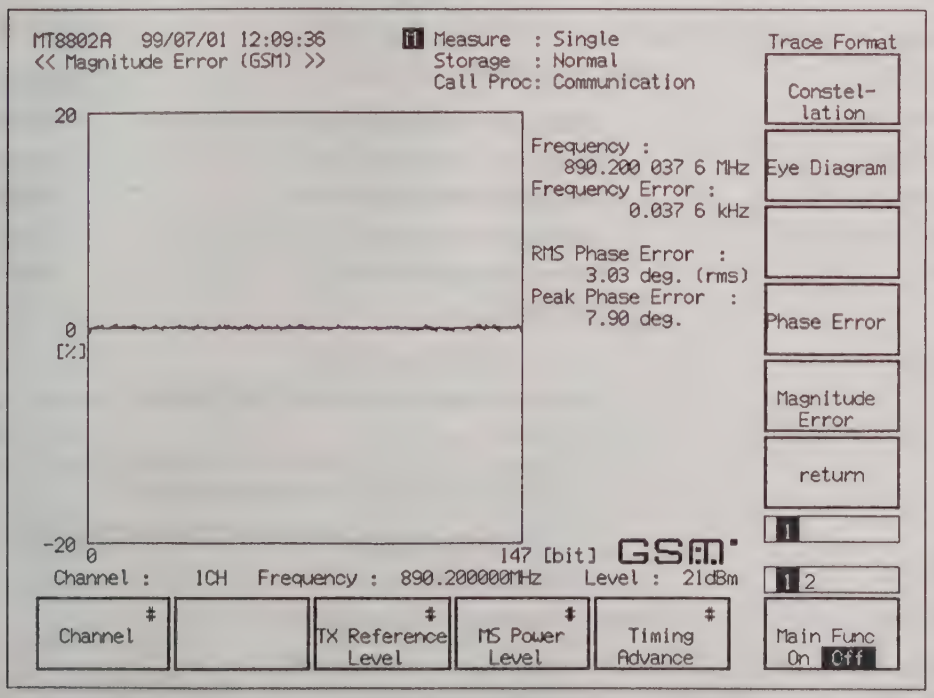



Fig. 4-17 Magnitude Error Screen

Note: The range of horizontal axis is changed to (0 to 87 bit) when the Measuring Object is set to RACH.

- Main Function keys

1st page

[Channel]F1
Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2
Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3
Changes the RCA reference level to measure the transmission level from MS.

[MS Power Level]F4
Changes the transmission level from MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

[Timing Advance]F5
Changes Time Advance of MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

2nd page

[RX Output Frequency]F2
Changes the reception frequency of MS (output frequency from the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3
Changes the reception level of MS (output level from the RCA).

[Loop Back On Off]F4
Turns the loop-back state of MS on or off.
Disappeared when DUT Control is None.

- Function keys:

1st page (common for all waveform screens)

[Trace Format]F7:
Displays the Trace Format menu.

[Constellation]F7:
Displays the Constellation screen (initial value).

[Eye Diagram]F8:
Displays the Eye Diagram screen.

[Phase Error]F10:
Displays the Phase Error screen.

[Magnitude Error]F11:
Displays the Magnitude Error screen.

[return]F12:
Returns to the previous menu.

[Marker]F8:
Displays the Marker menu.

[Normal]F7:
Sets the normal marker mode.
The screen enters the marker-position input wait state.
Resolution:
0.1 symbols (when Interpolation on Constellation display is 10 Points)
1 symbol (under other than the condition above)

[Off]F8:
Sets marker mode off and clears a marker display (initial value).

[return]F12:
Returns to the previous menu.

[Storage Mode]F9:
Displays the storage mode setup menu.

[Normal]F7:
Sets normal mode (initial value).

[Over Write]F8:
Sets overwriting mode.

[return]F12:
Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

- [Manual Calibration]F7: Performs level calibration. During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: Deletes level calibration data.
- [return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1 (2))

[Back Screen]F12: Displays the previous screen.

2nd page (when a Constellation screen is displayed)

[Interpolation]F7: Displays the interpolation mode menu.

- [Non]F7: Sets interpolation mode to no (initial value). (Symbol points are displayed with dots.)
- [Linear]F8: Sets interpolation mode to linear interpolation. (Symbol points are connected by a straight line.)
- [10 Points]F9: Sets interpolation mode to 10-point interpolation. (Symbol points are connected with interpolation of ten divisions.)
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

2nd page (when a Phase Error or Magnitude Error screen is displayed)

[Vertical Scale]F7: Displays the vertical scale menu.

(Magnitude Error)

- [5%]F7: Displays the 5% scale.
- [10%]F8: Displays the 10% scale.
- [20%]F9: Displays the 20% scale.
- [50%]F10: Displays the 50% scale.
- [100%]F11: Displays the 100% scale.
- [return]F12: Returns to the previous menu.

(Phase Error)

- [5deg.]F7: Displays the 5-degree scale.
- [10deg.]F8: Displays the 10-degree scale.
- [20deg.]F9: Displays the 20-degree scale.
- [50deg.]F10: Displays the 50-degree scale.
- [100deg.]F11: Displays the 100-degree scale.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

2nd page (when an Eye Diagram screen is displayed): No function key is displayed.

### (4) RF power (burst magnitude) measurement: RF Power screen, Setup Template screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure the RF power of the send signal from the transmitter.

For the burst signal measurement, the template (magnitude standard line) of the RF power waveform can be set (on Setup Template screen).

Note that a template can be displayed only when a relative level mode is set at burst signal measurement.

Notes:
- On the RF Power screen, the power sensor is not used; the internal IF level is used to measure the power.
- The template of each measurement screen is changed for RACH when the Measuring Object is set to RACH.

#### (a) Measuring the power: RF Power screen

- Display the RF Power screens according to the following steps:

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [RF Power]F9 | Displays the RF Power screen.<br>The first page of the RF Power menu appears. |

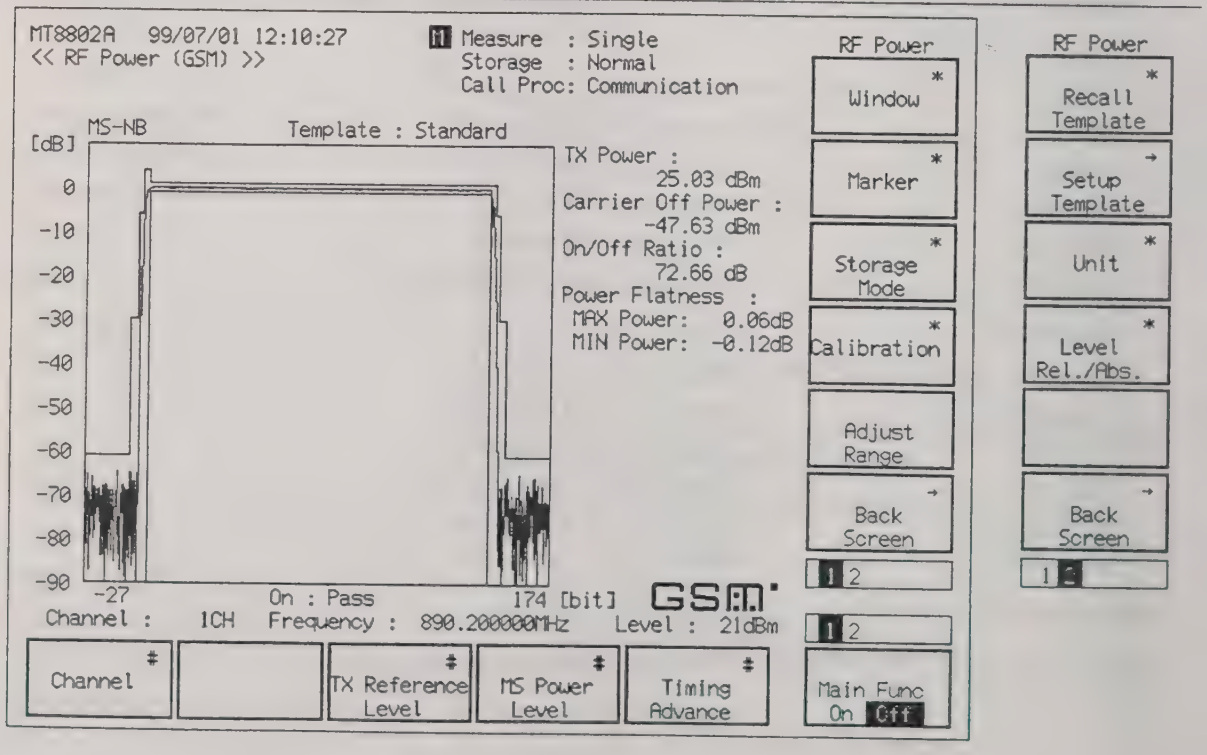
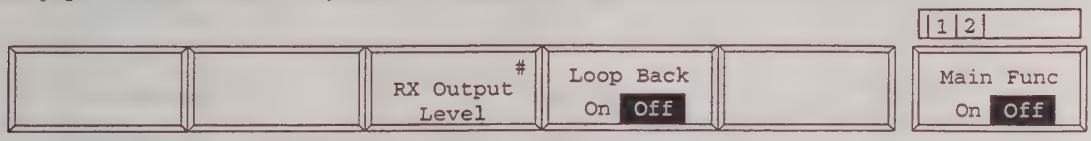
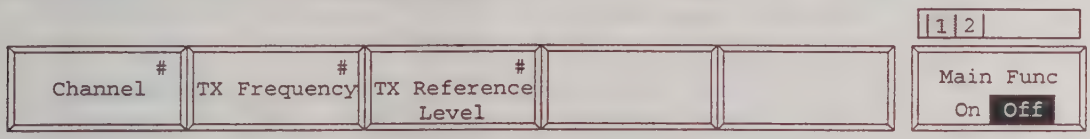


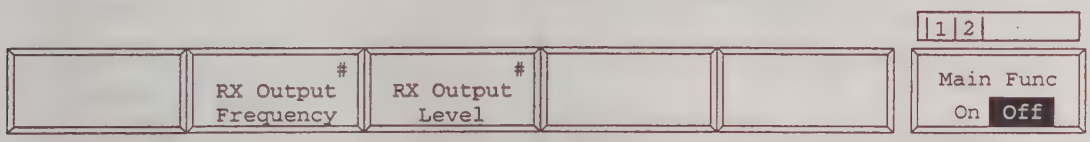

Fig. 4-18 RF Power Screen

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)



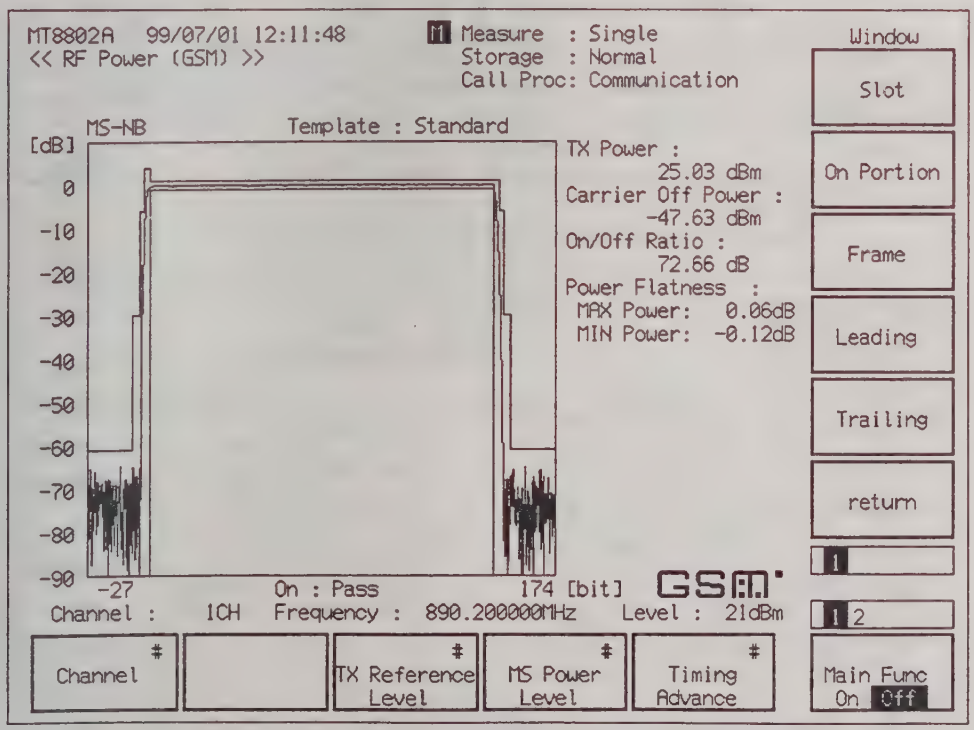




Fig. 4-19 RF Power Screen (Slot Window)

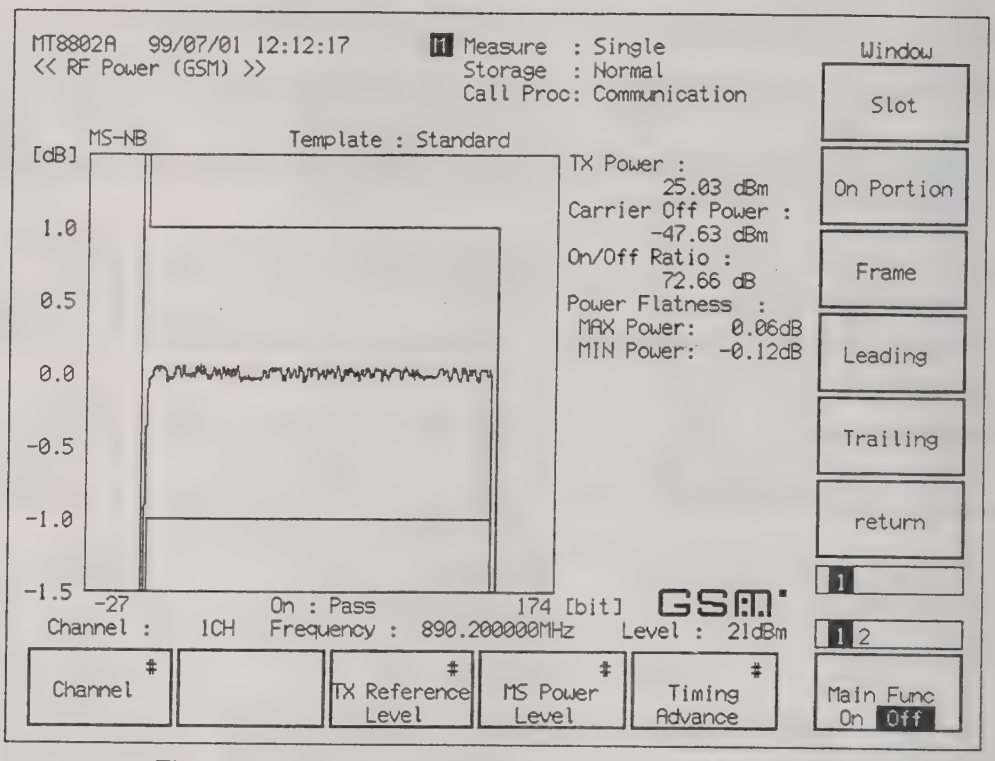



Fig. 4-20 RF Power Screen (On-Portion Window)

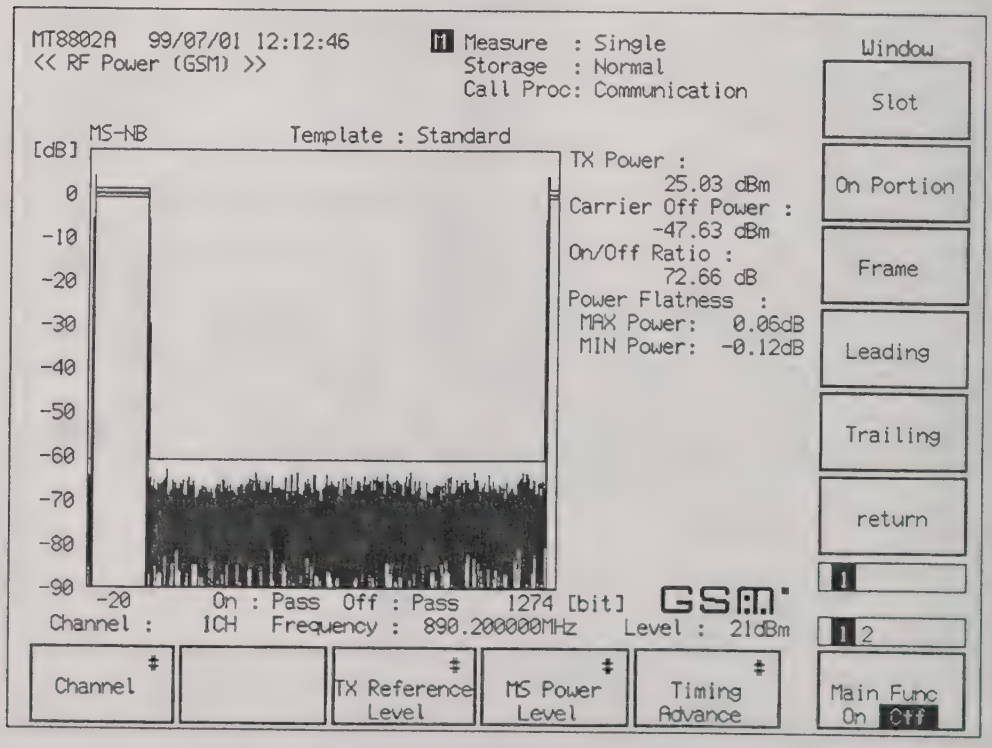



Fig. 4-21 RF Power Screen (Frame Window)

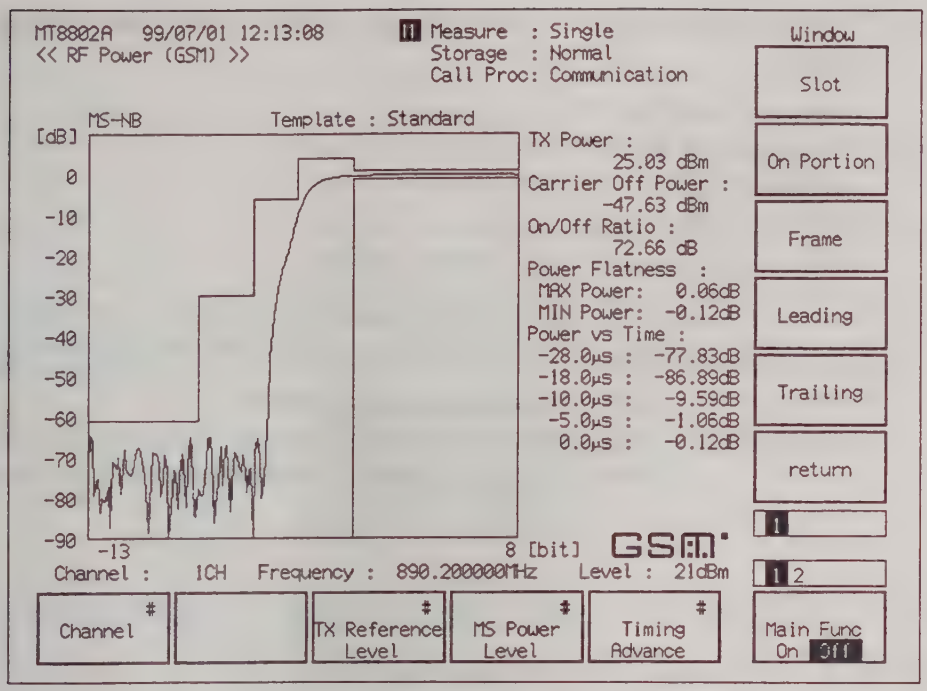



Fig. 4-22 RF Power Screen (Leading Window)

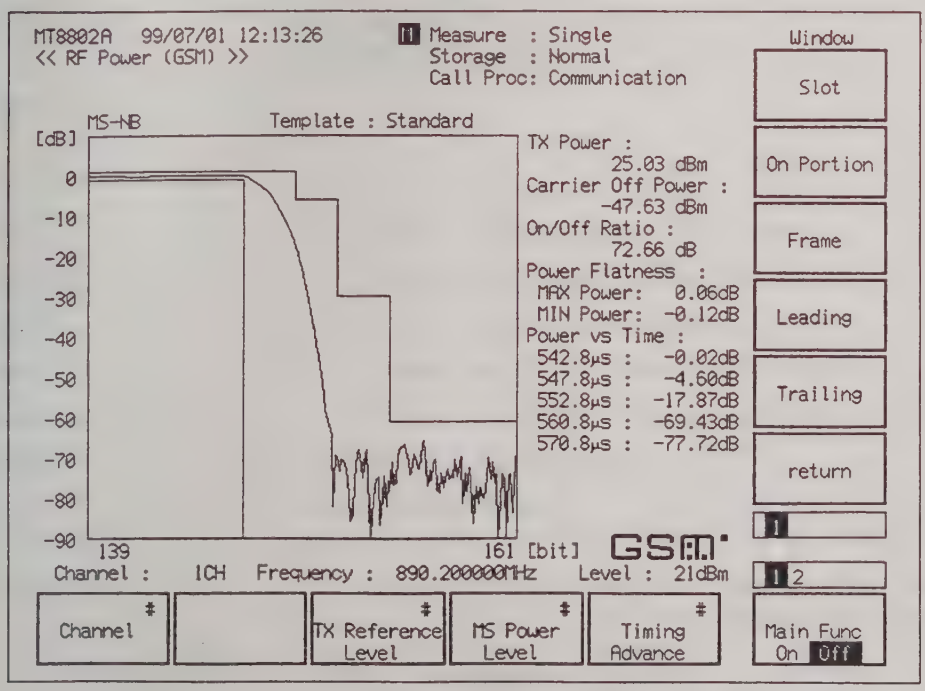



Fig. 4-23 RF Power Screen (Trailing Window)

Notes: • The values of RFPower vs Time are changed as follows when the Measuring Object is set to RACH.

542.8 µs → 321.2 µs
547.8 µs → 326.2 µs
552.8 µs → 331.2 µs
560.8 µs → 339.2 µs
570.8 µs → 349.2 µs

- When measuring the burst signal while the relative level of the magnitude measurement waveform is displayed, a template (magnitude standard line) can also be displayed.
- TX Power: Displays the average power in the burst .
  Carrier Off Power: Displays an average power when transmission is not performed. Carrier Off Power is displayed when the burst signal is measured.

- Main Function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the valuescorresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).
Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the RCA reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

[Timing Advance]F5 — Changes Time Advance of MS.
Disappeared when DUT Control is None. (Para. 4.3.5)

2nd page

[RX Output Frequency]F2 — Changes the reception frequency of MS (output frequency from the RCA).

Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3 — Changes the reception level of MS (output level from the RCA).

[Loop Back On Off]F4 — Turns the loop-back state of MS on or off.
Disappeared when DUT Control is None.

- Function keys:

1st page

[Window]F7: — Displays a waveform-window setup menu.

[Slot]F7: — Displays a waveform corresponding to one slot.

[On Portion]F8: — Displays a expanded waveform at the burst-on portion.

[Frame]F9: — Displays a waveform corresponding to one frame.

[Leading]F10: — Displays a waveform at the leading edge of the burst signal.

[Trailing]F11: — Displays a waveform at the trailing edge of the burst signal.

[return]F12: — Returns to the previous menu.

[Marker]F8: — Displays the Marker menu.
If this key is pressed when Off is selected, Normal is selected.

[Normal]F7: — Sets normal marker mode. Enters the marker-position input wait status.
Range: Lower limit to upper limit of horizontal display scale (unit: symbol)
Resolution: 0.1 symbol
Initial value: Center of the screen

[Off]F8: — Sets marker mode to off and clear the marker (initial value).

[return]F12: — Returns to the previous menu.

[Storage Mode]F9: Displays the storage mode setup menu.
Either of the following items can be selected:

1st page

[Normal]F7: Displays the normal waveform storage mode setup menu.

[Average]F8: Sets averaging mode.
Measure mode is set to Single.

[Average Count]F9: Sets the averaging count.
2 to 9,999, Resolution: 1, Initial value: 10

[Refresh Interval]F10: Sets the update time of the averaged-measurement data display.
Every: after every single measurement
Once: after the specified-count-measurement averaging processing

[Wide Dynamic Range]F11: Increases the vertical axis display range by 20 dB to make it 120 dB.
Measure mode is set to Single.
This item can be selected when RF Input is set to MAIN on the Instrument Setup screen and the measurement signal is a burst signal with a synchronous word.

[return]F12: Returns to the previous menu.

The 2nd page

[Max Hold]F7: Compares new and old waveform data items each time a measurement is performed, and displays the larger data item. (Maximum value holding)

[Min Hold]F8: Compares new and old data items each time a measurement is performed, and displays the smaller data item. (Minimum value holding)

[Cumulative]F9: Sets waveform dot data accumulation display mode.

[Over Write]F10: Sets the waveform overwriting mode.

[return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

[Manual Calibration]F7: Performs level calibration.
During calibration, the window indicating calibration in progress is displayed on the screen.

[Calibration Cancel]F8: Deletes level calibration data.

[return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals.
(See paragraph 4.3.1 (2))

[Back Screen] (F12): Displays the previous screen.

2nd page

[Recall Template]F7: Displays the template calling menu. (See paragraph 4.3.9)

[Setup Template]F8: Displays the template setup (Setup Template) screen. (See paragraph 4.3.6, (4), (b).)

[Unit]F9: Displays the power measurement unit menu.

- [dBm]F7: Sets the power measurement value unit to dBm (initial value)
- [nW/μW/mW/W]F8: Switches the power measurement value unit to the watt system.
- [return]F12: Returns to the previous menu.

[Level Rel./Abs.]F10: Displays the menu for selecting absolute or relative display of the waveform vertical axis scale.

- [Relative]F7: Sets the waveform vertical axis scale to relative display (dB).

  This function key displays a relative value from the average power at burst-on (initial value).
- [Absolute]F8: Sets the waveform vertical scale to absolute display (dBm). No template is displayed.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

(b) Setting the template: Setup Template screen

- Display the Setup Template according to the following steps:

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [RF Power]F9 | Displays the RF Power screen.<br>The first page of the RF Power menu appears. |
| 5. | Next Menu [▲] | Displays the second page of the RF Power menu. |
| 6. | [Setup Template]F8 | Displays the Setup Template screen. |

Note: The steps for this setting the template are same when the Measuring Object is set to RACH.

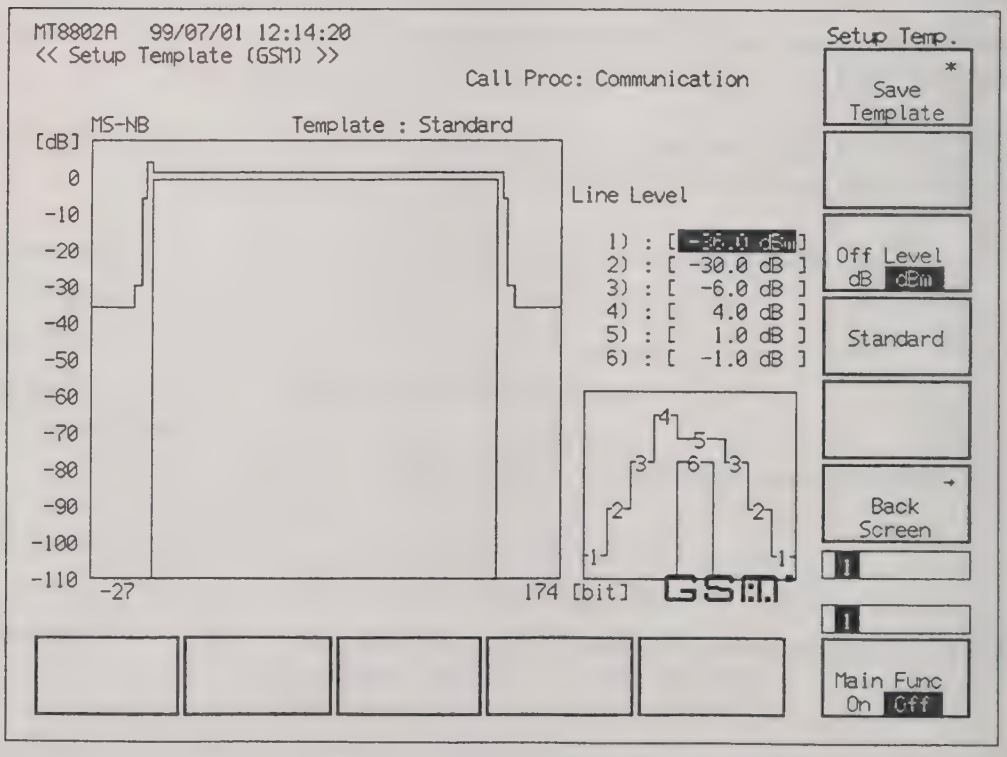



Fig. 4-24 Setup Template Screen (Standard)

Note: When the template to be called is modified, the template name becomes "Not Selected" indicating that the template is not saved in internal memory.

- Set the following items on the Setup Template screen.

| Item | Range | Resolution | Initial value |
|---|---|---|---|
| Line Level | | | |
| 1 | -110.0 to 10.0 dB/dBm | 0.1 dB | standard value |
| 2 | -110.0 to 10.0 dB | 0.1 dB | standard value |
| 3 | -110.0 to 10.0 dB | 0.1 dB | standard value |
| 4 | -110.0 to 10.0 dB | 0.1 dB | standard value |
| 5 | -110.0 to 10.0 dB | 0.1 dB | standard value |
| 6 | -110.0 to 10.0 dB | 0.1 dB | standard value |

- Function keys

Main function key: None

Function keys:

[Save Template]F7: Displays the template calling menu. (See paragraph 4.3.9)

[Off Level dB dBm]F9: Selects a template level-1 unit (dB or dBm). (Initial value: dB)

[Standard]F10: Sets the standard template.

[Back Screen]F12: Displays the previous screen.

### (5) Output RF spectrum measurement: Output RF Spectrum screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.4, (1), (a)) to measure the spectrum at the upper and lower offset frequencies of a send signal from the transmitter.

- Display the Output RF Spectrum screen according to the following steps:

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [Output RF Spectrum]F10 | Displays the Output RF Spectrum screen. |

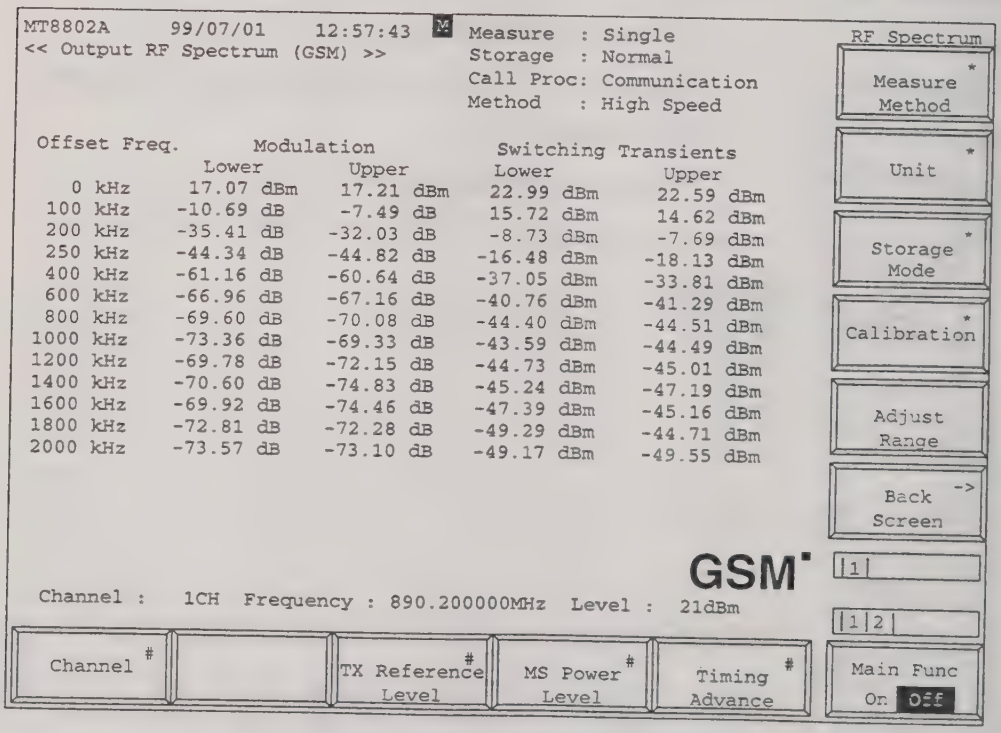
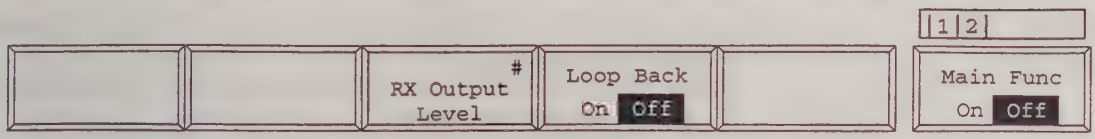

MT8802A 99/07/01 12:57:43 M
<< Output RF Spectrum (GSM) >>
Measure : Single
Storage : Normal
Call Proc: Communication
Method : High Speed
RF Spectrum
Measure Method
Unit
Storage Mode
Calibration
Adjust Range
Back Screen
Offset Freq. Modulation Switching Transients
Lower Upper Lower Upper
0 kHz 17.07 dBm 17.21 dBm 22.99 dBm 22.59 dBm
100 kHz -10.69 dB -7.49 dB 15.72 dBm 14.62 dBm
200 kHz -35.41 dB -32.03 dB -8.73 dBm -7.69 dBm
250 kHz -44.34 dB -44.82 dB -16.48 dBm -18.13 dBm
400 kHz -61.16 dB -60.64 dB -37.05 dBm -33.81 dBm
600 kHz -66.96 dB -67.16 dB -40.76 dBm -41.29 dBm
800 kHz -69.60 dB -70.08 dB -44.40 dBm -44.51 dBm
1000 kHz -73.36 dB -69.33 dB -43.59 dBm -44.49 dBm
1200 kHz -69.78 dB -72.15 dB -44.73 dBm -45.01 dBm
1400 kHz -70.60 dB -74.83 dB -45.24 dBm -47.19 dBm
1600 kHz -69.92 dB -74.46 dB -47.39 dBm -45.16 dBm
1800 kHz -72.81 dB -72.28 dB -49.29 dBm -44.71 dBm
2000 kHz -73.57 dB -73.10 dB -49.17 dBm -49.55 dBm
GSM
Channel : 1CH Frequency : 890.200000MHz Level : 21dBm
1
1 2
Channel
TX Reference Level
MS Power Level
Timing Advance
Main Func On Off

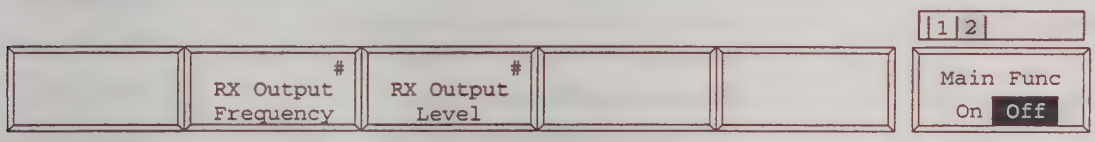
Fig. 4-25 Output RF Spectrum Screen

Note: This screen do not appear when the Measuring Object is set to RACH.

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)




Notes:
- The Switching Transient is displayed in the unit (dBm/dB) set on the Select All Measure Item screen.
- Output RF Spectrum is not measured when the Measuring Object is set to RACH.

- Main Function keys

1st page

| | |
|---|---|
| [Channel]F1 | Changes channel number.<br>When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number. |
| [TX Frequency]F2 | Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).<br>Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number. |
| [TX Reference Level]F3 | Changes the RCA reference level to measure the transmission level from MS. |
| [MS Power Level]F4 | Changes the transmission level from MS.<br>Disappeared when DUT Control is None. (Para. 4.3.5) |
| [Timing Advance]F5 | Changes Time Advance of MS.<br>Disappeared when DUT Control is None. (Para. 4.3.5) |

2nd page

| | |
|---|---|
| [RX Output Frequency]F2 | Changes the reception frequency of MS (output frequency from the RCA).<br>Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number. |
| [RX Output Level]F3 | Changes the reception level of MS (output level from the RCA). |
| [Loop Back On Off]F4 | Turns the loop-back state of MS on or off.<br>Disappeared when DUT Control is None. |

- Function keys:

[Measure Method]F7: Displays the measure method setup menu.

[High Speed]F9: Sets High Speed method.

[return]F12: Returns to previous menu.

[Unit]F8: Displays the switching transients measurement value unit menu.

[dBm]F7: Sets the switching transients measurement value unit to dBm. (initial value)

[dB]F8: Sets the switching transients measurement value unit to dB.

[return]F12: Returns to previous menu.

[Storage Mode]F9: Displays the storage mode setup menu.

[Normal]F7: Sets normal mode (initial value).

[Average]F8: Sets averaging mode.
The Measure mode is set to Single.

[Average Count]F9: Sets the averaging count.
2 to 9999, Resolution: 1, Initial value: 10

[Refresh Interval]F10: Sets the update time of the averaged-measurement data display.
Every: after every single measurement
Once: after the specified-count-measurement averaging processing

[return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

[Manual Calibration]F7: Performs level calibration.
During calibration, the window indicating that calibration in progress is displayed on the screen.

[Calibration Cancel]F8: Deletes the level calibration data.

[return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signals. (See paragraph 4.3.1 (2))

[Back Screen]F12: Displays the previous screen.

### (6) RF power (average) measurement: Power Meter screen

Use the power sensor to measure the average power on the Power Meter screen.

• Display the Power Meter screen according to the following steps:

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Test mode.<br>The Setup Common Parameter screen appears. |
| 3. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 4. | [Power Meter]F12 | Displays the Power Meter screen. |

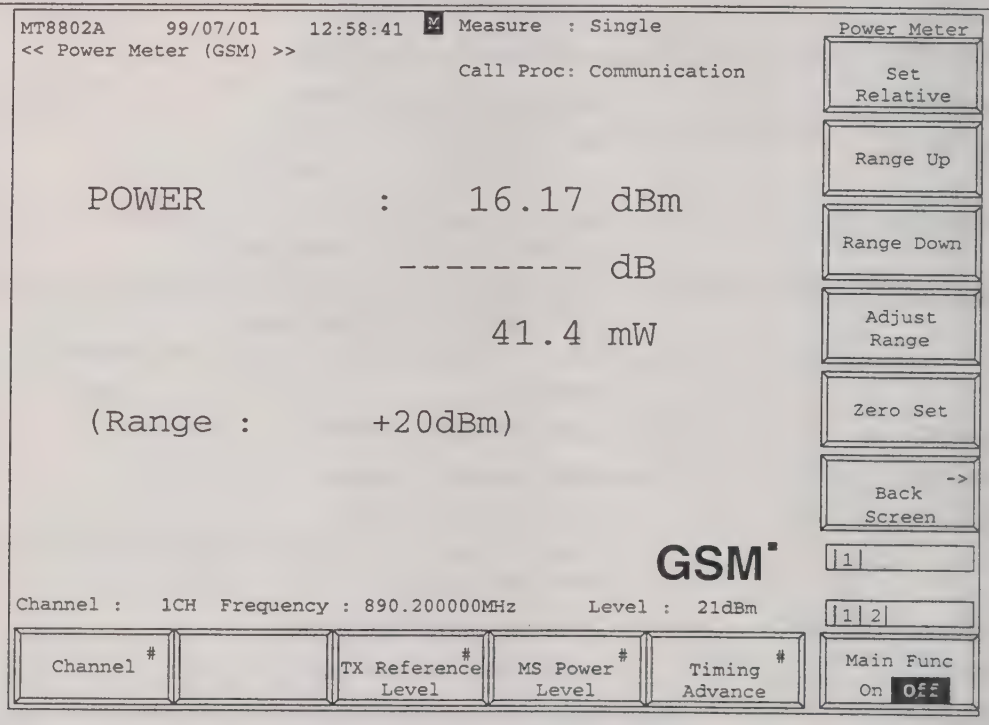
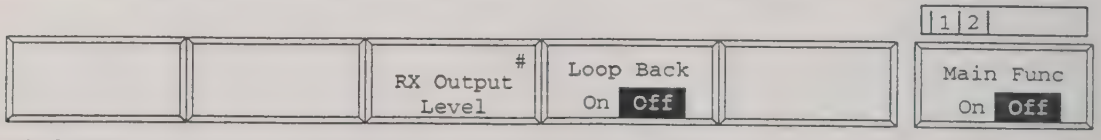
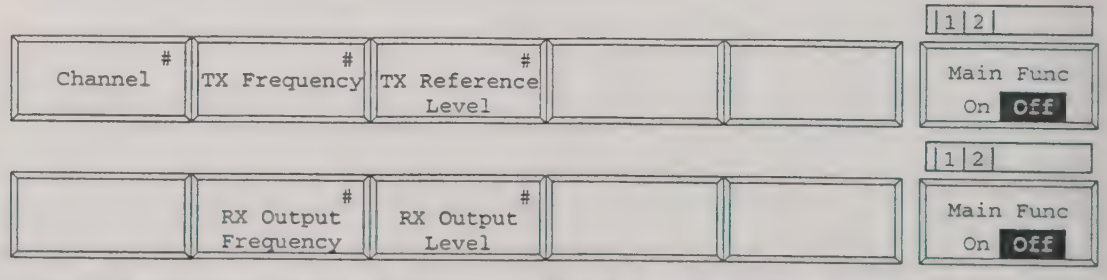



Fig. 4-26 Power Meter Screen

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)




The main function keys on the TX measurement screen (DUT Control: None)




Note: The measured resultes are displayed in units of dBm/dB (relative display)/W in this order.

- Main Function keys

1st page

| | |
|---|---|
| [Channel]F1 | Changes channel number.<br>When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number. |
| [TX Frequency]F2 | Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the RCA).<br>Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number. |
| [TX Reference Level]F3 | Changes the RCA reference level to measure the transmission level from MS. |
| [MS Power Level]F4 | Changes the transmission level from MS.<br>Disappeared when DUT Control is None. (Para. 4.3.5) |
| [Timing Advance]F5 | Changes Time Advance of MS.<br>Disappeared when DUT Control is None. (Para. 4.3.5) |

2nd page

| | |
|---|---|
| [RX Output Frequency]F2 | Changes the reception frequency of MS (output frequency from the RCA).<br>Disappeared when DUT Control is Call Proc, and becomes the value corresponding to the channel number. |
| [RX Output Level]F3 | Changes the reception level of MS (output level from the RCA). |
| [Loop Back On Off]F4 | Turns the loop-back state of MS on or off.<br>Disappeared when DUT Control is None. |

- Function keys:

| | |
|---|---|
| [Set Relative]F7: | Enables to display the power measurement result using a relative value.<br>The reference value is the power measurement value immediately before setting the relative value display.<br>If the Power Meter screen is switched to another screen or the power is turned off, the screen enters absolute value display mode and the set reference value is invalid. |
| [Range Up]F8: | Increases the measurement range. |
| [Adjust Range]F10: | Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal.<br>(See paragraph 4.3.1, (2)) |
| [Zero Set]F11: | Adjusts zero-point of the power meter, as described below. |
| [Back Screen]F12: | Displays the previous screen. |

• Power meter zero calibration

To make accurate RF power measurement in transmitter measurement (TX Measure mode), calibrate the zero position o the power meter as described below.

| Step | Key operation | Description |
|---|---|---|
| 1. | | Remove any signal input to the RF input connector (Main). |
| 2. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 3. | [TX&RX Tester]F1 | Sets the TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 4. | [TX Measure]F1 | Displays the first page of the TX Measure menu. |
| 5. | [Power Meter]F12 | Displays the Power Meter screen. |
| 6. | [Zero Set]F11 | Zero-calibrates the power meter.<br>During zero calibration, the window indicating that calibration is being performed is displayed on the screen. |
| 7. | [Back Screen]F12 | Returns to the Setup Common Parameter screen. |

## 4.3.7 Receiver test: RX Measure mode

This paragraph describes how to set parameters (Setup RX Measure Parameter) and measure the bit error rate (on Bit Error Rate screen).

### (1) Setting parameters: Setup RX Measure Parameter screen

The following describes how to set parameters (Setup RX Measure Parameter screen) when conducting the receiver test (RX Measure mode).

- Display the Setup RX Measure Parameter according to the following steps, then set the RX parameters.

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [RX Measure]F2 | Displays the RX Measure menu. |
| 4. | Next Menu[▲] | Displays the 2nd page of the RX Measure menu. |
| 5. | [Setup RX Parameter]F8 | Displays the Setup RX Measure Parameter screen. |

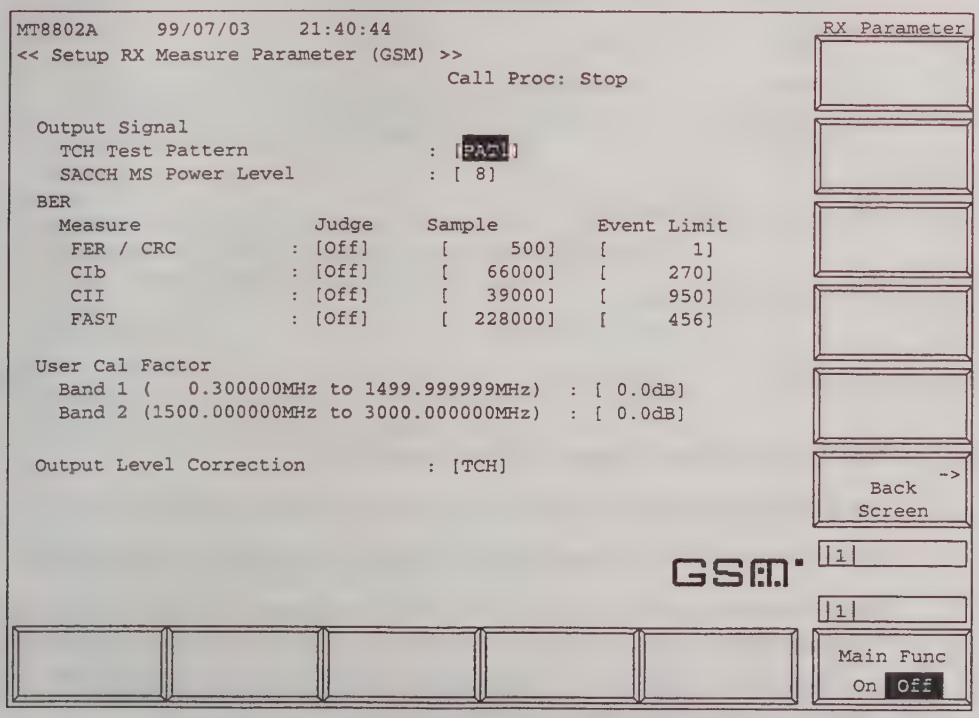

MT8802A 99/07/03 21:40:44
<< Setup RX Measure Parameter (GSM) >>
Call Proc: Stop
Output Signal
TCH Test Pattern : [PAT1]
SACCH MS Power Level : [ 8]
BER
Measure Judge Sample Event Limit
FER / CRC : [Off] [ 500] [ 1]
CIb : [Off] [ 66000] [ 270]
CII : [Off] [ 39000] [ 950]
FAST : [Off] [ 228000] [ 456]
User Cal Factor
Band 1 ( 0.300000MHz to 1499.999999MHz) : [ 0.0dB]
Band 2 (1500.000000MHz to 3000.000000MHz) : [ 0.0dB]
Output Level Correction : [TCH]
RX Parameter
Back Screen
GSM
Main Func On Off

Fig. 4-27 Setup RX Measure Parameter Screen

• Set the following items:

| Item | | Range | Initial value | |
|---|---|---|---|---|
| Output Signal | | | | |
| TCH Test Pattern | | PAT0, PAT1, PAT2, PAT3, PAT4, PAT5, PAT6, PAT7, PAT8, PAT9, PN15, E0 | PAT1 | Note 1, 2 |
| SACCH MS Power Level | | 0 to 31 | 8 | Note 3 |
| BER | | | | |
| Measure | | | | |
| FER/CRC | Judge: | On, Off | | Note 4 |
| | Sample: | 0 to 99 999 999 | | |
| | Event Limit: | 0 to 99 999 999 | | |
| CIb | Judge: | On, Off | | |
| | Sample: | 0 to 99 999 999 | | |
| | Event Limit: | 0 to 99 999 999 | | |
| CII | Judge: | On, Off | | |
| | Sample: | 0 to 99 999 999 | | |
| | Event Limit: | 0 to 99 999 999 | | |
| FAST | Judge: | On, Off | | |
| | Sample: | 0 to 99 999 999 | | |
| | Event Limit: | 0 to 99 999 999 | | |
| User Cal Factor | | | | |
| Band 1 (0.3 MHz to 1499.999 999MHz) | | -30.0 to 30.0 dB | 0.0 dB | Note 5 |
| Band 2 (1500 MHz to 3000 MHz) | | -30.0 to 30.0 dB | 0.0 dB | |
| Output Level Correction | | CCH,TCH | TCH | Note 6 |

Notes : 1 PN15 is the M-series 15-stage pseudo-random pattern.

The output data section of E0 pattern becomes ALL 0 after channel coding.

2 Actual values of the TCH Test Patterns are 260-bits fixed patterns shown below:

They are shown in hexa-decimal format, which are sequentially transmitted from the MSB. The fixed patterns shown below is FR (260 bits). When the Codec is EFR, 244 bits are transmitted from the MSB in the fixed patterns. When the Codec is HR0 or HR1, only 112 bits are transmitted from the MSB in the fixed patterns.

Example: PAT4 is 4EC3....., which is transmit in the binary sequence of Ø1ØØ111Ø11ØØØØ11.....

```
PAT0 : +--------+---------+---------+--
       55555555555555555555555555555555
       55555555555555555555555555555555
       5

PAT1 : +--------+---------+---------+--
       AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
       AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
       A

PAT2 : +--------+---------+---------+--
       ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ
       ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ
       Ø

PAT3 : +--------+---------+---------+--
       FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
       FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
       F

PAT4 : +--------+---------+---------+--
       4EC3Ø29E7DF836AC53DC1A8D69E82ØB7
       44CDØE9776FØ39A55ED4118462EØ2CBA
       4

PAT5 : +--------+---------+---------+--
       65E729BC4CC1ØØ9C7EFB34AF51DF188E
       6AEB23B547CEØC9574F33AA65CD71287
       6

PAT6 : +--------+---------+---------+--
       DØ178Ø65E729BC4CC1ØØ9C7EFB34AF51
       DF188E6AEB23B547CEØC9574F33AA65C
       D

PAT7 : +--------+---------+---------+--
       A75DD6138661E22EB948C7Ø7997AFC3Ø
       AA56DA1F8B6CEC25BØ43CBØ89Ø7ØF43C
       A

PAT8 : +--------+---------+---------+--
       34AF51DF188E6AEB23B547CEØC9574F3
       3AA65CD712876ØE32FB849C6Ø6987BFD
       3

PAT9 : +--------+---------+---------+--
       997AFC3ØAA56DA1F8B6CEC25BØ43CBØ8
       9Ø7ØF43CA358D2148267E42BBE4EC3Ø2
       9
```

3 For the actual values of the SACCH MS Power Level: 0 to 31, see para. 4.3.5. The set values in this screen are also set at the MS Power Level in other screens.

4 Set them so that Event Limit ≤ Sample.

5 The actual RX Output Level is set according to following equation Actual RX Output Level = RX Output Level setting + User Cal Factor For User Cal Factor, the loss in the RF cable connecting the RCA and device under the test is set as a correction value.

6 When the MS's Call Processing Status is Communication, the RX Output Level Correction is applied to either CCH or TCH.

The Output Level of selected channel meets the level accuracy in RCA's specifications. (Para 1.5)

- Function keys

Main function key: None

Function keys:

[Back Screen]F12: Displays the previous screen

### (2) Measuring the bit error rate: Bit Error Rate screen

The following describes how to measure the bit error rate (on Bit Error Rate screen) of the receiver by using the parameters set on the Setup RX Measure Parameter screen (see paragraph 4.3.7, (1)).

Some set items can be changed by using the function keys.

- Display the Bit Error Rate screen according to the following steps to measure the bit error rate.

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on to display the Main Menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [RX Measure]F2 | Displays the RX Measure menu. |
| 4. | [Bit Error Rate]F7 | Displays the Bit Error Rate screen. |

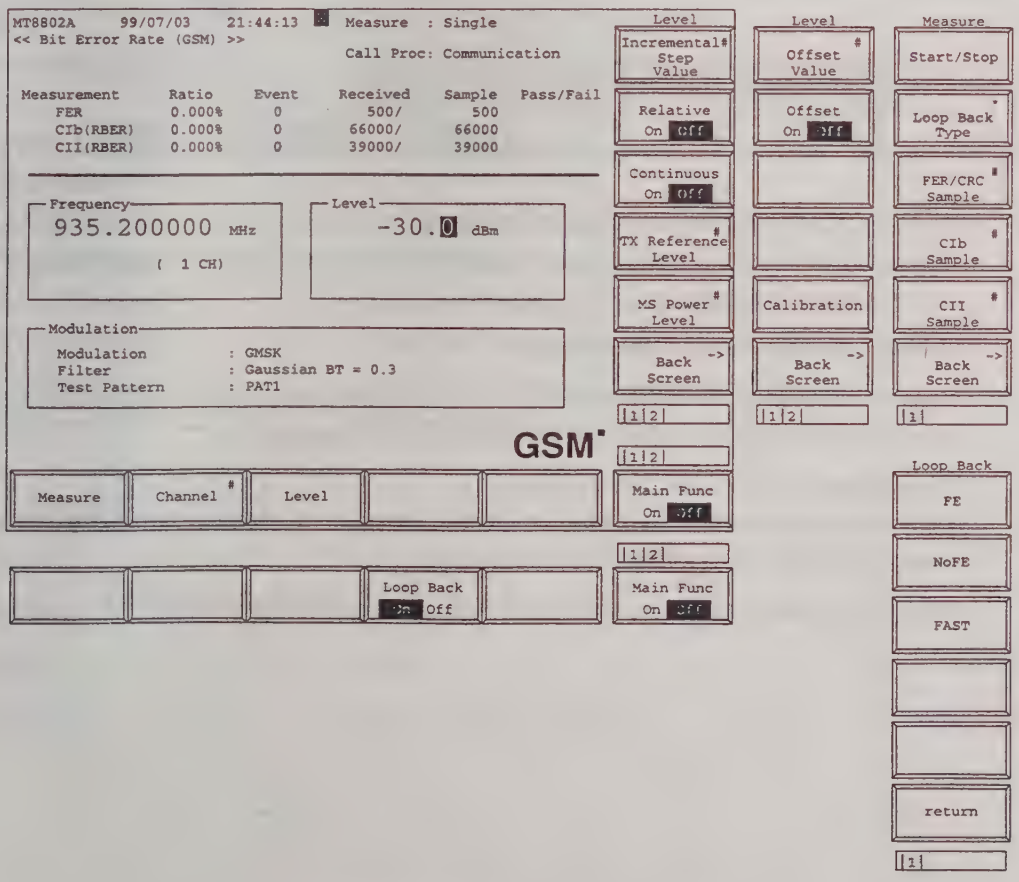
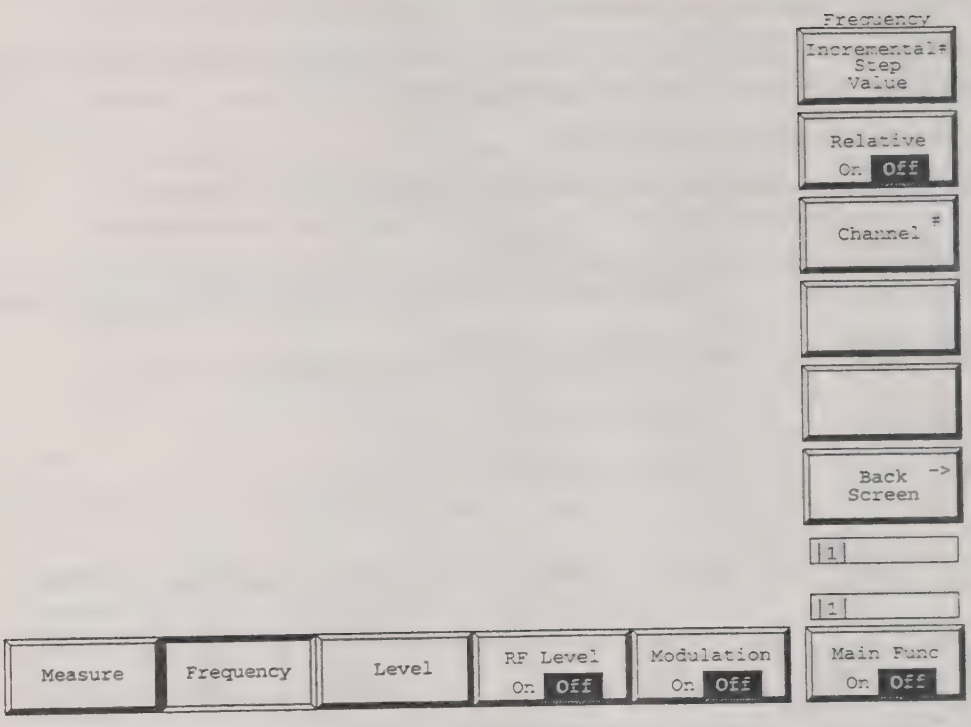



Fig. 4-28 Bit Error Rate Screen

When the DUT Control is set to None, the main function key [Channel]F2 changes to [Frequency]F2.
Additionally, [RF Level On Off]F4 and [Modulation On Off]F5 appear.
There is no 2nd page for the main function keys.




Notes:
- If synchronization failure occurs at start of or during measurement, Pattern Sync Loss is displayed. In this case, measurement stops until synchronization is established. When synchronization is established, measurement starts.
- When the Measure mode is set to Single:

  The intermediate measurement result is updated and displayed. When the number of data items reaches the specified number, measurement terminates.

  When Measure mode is set to Continuous:
  The measurement result is updated when measurement of the specified number of data items terminates. Measurement is then restarted.
- FE and NoFE Mode do not appear when the Codec is set to HR0 or HR1.

• Main Function keys:

1st page

[Measure]F1: Displays the Measure menu on F7 to F12.

[Channel]F2 Displays a channel setting window.
When the DUT Control is set to None, this changes to [Frequency]F2.

[Frequency]F2: The output frequency setup menu appears on F7 to F12.
When the DUT Control is set to Call Proc, this changes to [Channel]F2.

[Level]F3: The output level setup menu appears on F7 to F12.

[RF Level On Off]F4: Sets the output level On or Off. Initial value: Off
When the DUT Control is set to Call Proc, this is not displayed. (Always set to On.)

[Modulation On Off]F5: Sets Modulation On or Off. Initial value: Off
When the DUT Control is set to Call Proc, this is not displayed. (Always set to On.)

2ndpage

[Loop Back On Off]F4: Turns MS(mobile station to be tested) loop-back state On and Off.
When the DUT Control is set to None, this is not displayed.

• Function keys:

--- Measure menu ---

[Start/Stop]F7: Starts (restarts) or stops measurement.

[Loop Back Type]F8: Starts (restarts) or stops measurement.

[FER/CRC Sample]F9: Changes the number of FER-measurement samples.

[CIb Sample]F10: Changes the number of CIb-measurement samples.

[CII Sample]F11: Changes the number of CII-measurement samples.

[Back Screen]F12: Displays the previous screen.

--- Loop Back menu ---

[FE]F7: FE mode

[NoNE]F8: NoFE mode

[FAST]F9: FAST

[Return]F12: Return to the previous menu.

-- Frequency menu ---

When the DUT Control is set to None, Frequency menu is not displayed, and the Channel changing window appears.

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output frequency value by using the Step keys.

Range: 1 Hz to 3 GHz
Resolution: 1 Hz
Initial value: 1 MHz

[Relative On Off]F8: Displays the relative output frequency based on the reference value immediately before setting Relative On.

Range: On, Off Initial value: Off

Note: If a frequency is set using a numeric key when this item is On, the value becomes the real output frequency.
Relative display value =
Value set by numeric key - Value before setting On

[Channel]F9: Sets the channel number.

[Back Screen]F12: Displays the previous screen.

--- Level menu ---

1st page

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output level by using the Step keys.

Range: 0.1 to 80 dB
Resolution: 0.1 dB
Initial value: 1 dB

[Relative On Off]F8: Displays a relative output level based on the reference value (dB unit) immediately before setting Relative On.

Range: On, Off Initial value: Off

Note: If a level is set using a numeric key when this item is set On, the value becomes the real output level.
Relative display value =
Value set using a numeric key - Value before setting On

[Continuous On Off]F9: Sets a mode in which an output level can be changed without an interrupt in the range of 20 dB. If a value immediately before setting Continuous On is assumed to be L0 dBm, the level can be changed by using the rotary knob without an interrupt in the range of 20 dB. (The Step and numeric keys are invalid.)

(L0 - 20) dBm ≤ Output level ≤ L0 dBm

[TX Reference Level]F10 Changes the reference level of the RCA to measure the transmission level of the MS.

[MS Power Level]F11 Changes the transmission level of the MS.
Not displayed when the DUT Control is set to None (See Paragraph 4.3.5).

[Back Screen]F12: Displays the previous screen.

2nd page

[Offset Value]F7:

Sets an offset value in output level offset display mode. The loss in the RF cable connecting the RCA and receiver under test can be corrected by using this key. (See paragraph 4.3.1, (4).)

Range: -55.0 to 55.0 dB
Resolution: 0.1 dB
Initial value: 0 dB

[Offset On Off]F8:

Increases or decreases the real output level to display.
Displayed value = Real output level value + Offset value

Range: On, Off Initial value: Off

Note: If a level is set using a numeric key when this item is On, the value becomes the displayed value.
Real output level value = Displayed value - Offset value

[Back Screen]F12:

Displays the previous screen.

## 4.3.8 Connection test: Call Processing mode

This paragraph describes the parameter setup (Setup Call Processing Parameter screen) and the connection test (Sequence Monitor screen).

### (1) Setting parameters: Setup Call Processing Parameter screen

The following describes the parameter setup (Setup Call Processing Parameter screen) to conduct the connection test (Call Processing mode).

- Display the Setup Call Processing Parameter screen and set the parameters as shown below.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func On Off]F6 | Sets Main Func to ON to display the main menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [Call Processing]F3 | Displays the Call Processing menu. |
| 4. | Next Menu[^] | Displays the 2nd page of the Call Processing menu. |
| 5. | [Setup Call Proc Parameter]F7 | Displays the Setup Call Processing Parameter screen. |

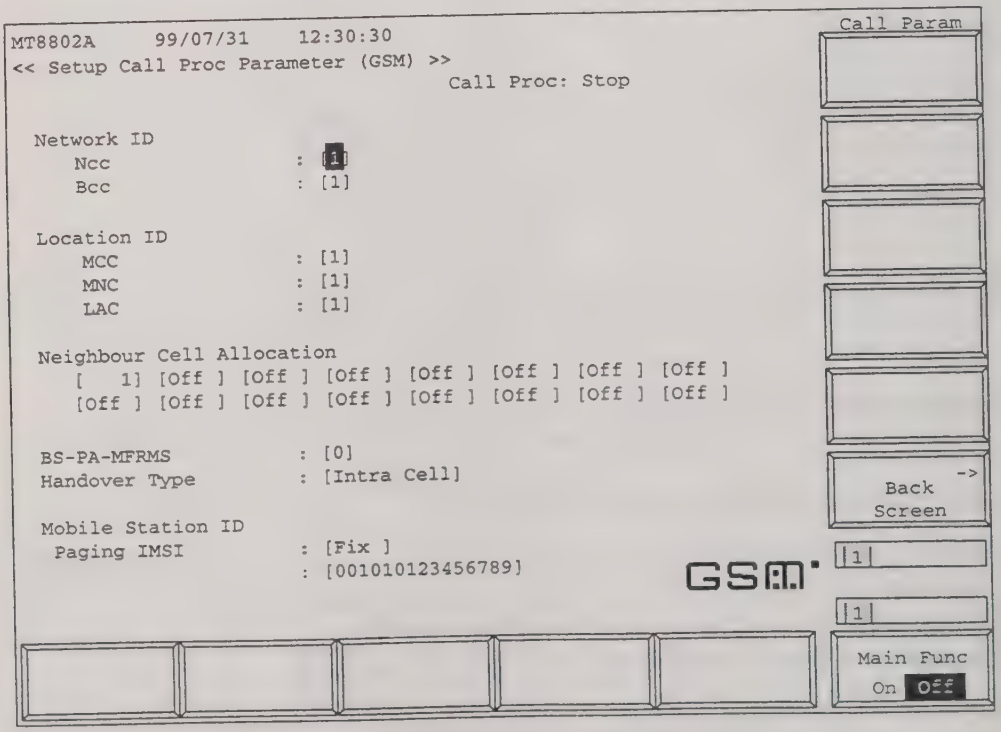



Fig. 4-29 Setup Call Processing Parameter Screen

• Set the following items:

| Item | Range | Initial value |
|---|---|---|
| Network ID | | |
| Ncc | 0 to 7 | 1 |
| Bcc | 0 to 7 | 1 |
| Location ID | | |
| MCC | 0 to 999 | 1 |
| MNC | 0 to 99 | 1 |
| LAC | 0 to 65535 | 1 |
| Neigbour Cell Allocation | | |
| | -1 to 124 (GSM) | -1 (off) |
| | -1 to 1023 (GSM/DCS1800, GSM/PCS1900) | |
| BS-PA-MFRMS | 0 to 7 | 0 |
| Handover Type | Intra Cell/Inter Cell (Sync) | Intra Cell |
| Mobile Station ID | | |
| Paging IMSI | Fix, Auto | Fix |
| | 0 to 999999999999999 | |

Note: The following shows the cases where the setup is enabled or disabled depending on the Call Processing status.

• List of settable items for each status

O: enabled X: disabled and opens error-message window.

| | DUT Control:None | DUT Control:Call Proc MT8801 Stop | DUT Control:Call Proc Status 0 | DUT Control:Call Proc Status 1 | DUT Control:Call Proc Status 2 |
|---|---|---|---|---|---|
| Ncc | O | O | X | X | X |
| Bcc | O | O | X | X | X |
| MCC | O | O | X | X | X |
| MNC | O | O | X | X | X |
| LAC | O | O | X | X | X |
| Paging IMSI | O | O | X | X | X |
| TMSI | O | O | X | X | X |

status0 = Idle

status1 = Paging, RadioLink, Registration, Origination, Termination, Hand Over, Disc from NT, Disk from MS, Radio Disc

status2 = Communication

Paging IMSI switches IMSI to be sent to the mobile station when performing Paging.

FIX : use the user-defined value for Paging.

AUTO : use the value sent from the mobile station for Paging.

• Main function keys: None

• Function keys

[Back Screen]F12 Displays the previous screen.

### (2) Connection test --- Sequence Monitor screen

The following describes the connection test conducted according to the parameters set on the Setup CallProcessing Parameter screen.

- Display the Sequence Monitor screen and conduct the connection test.

| Step | Key operation | Description |
|---|---|---|
| 1. | [Main Func On Off]F6 | Sets Main Func to ON to display the main menu at the bottom of the screen. |
| 2. | [TX&RX Tester]F1 | Sets TX&RX Tester mode.<br>The Setup Common Parameter screen appears. |
| 3. | [Call Processing]F3 | Displays the Call Processing menu. |
| 4. | [Sequence Monitor]F7 | Displays the Sequence Monitor screen. |

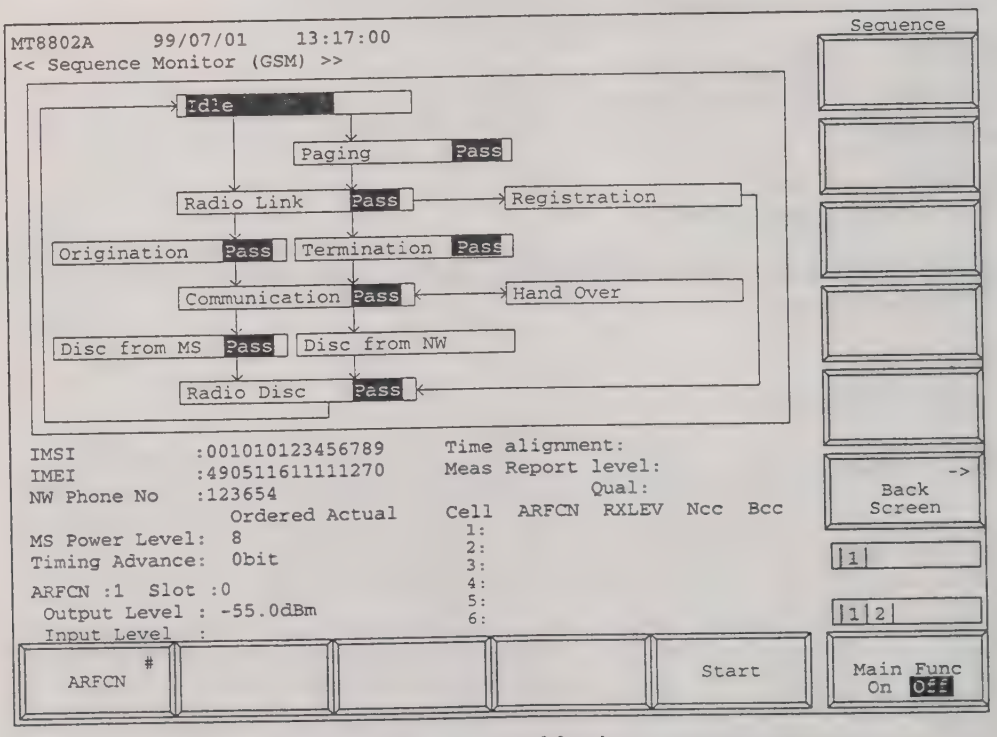
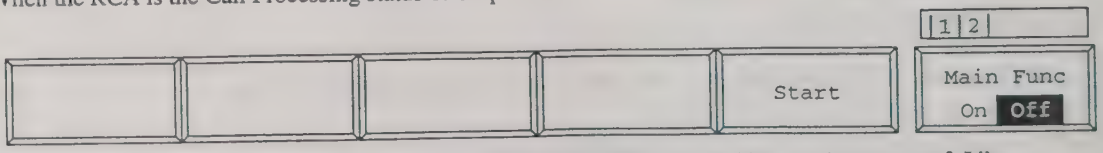


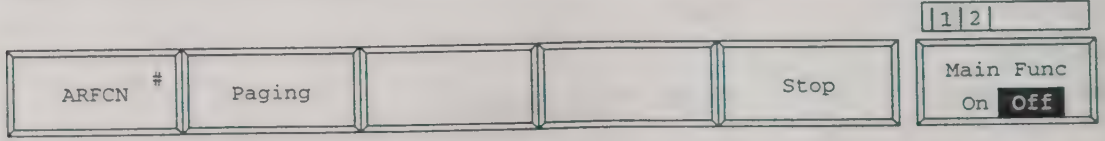

Fig. 4-30 Sequence Monitor screen

- 1st page of the main function keys on the Sequence Monitor screen

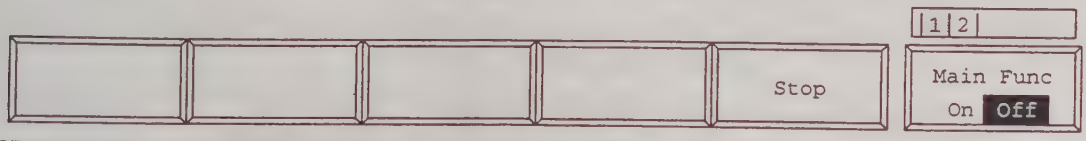
(1) When the RCA is the Call Processing status of Stop



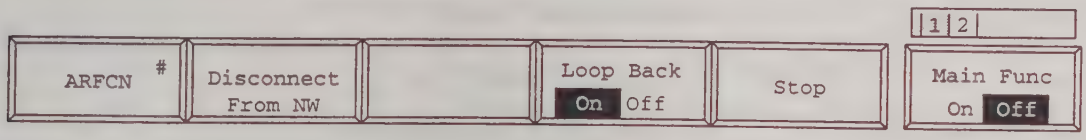

(2) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle



(3) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Paging, Radio Link, Registration, Origination, Termination, Hand Over, Disc from MS or Radio Disc.



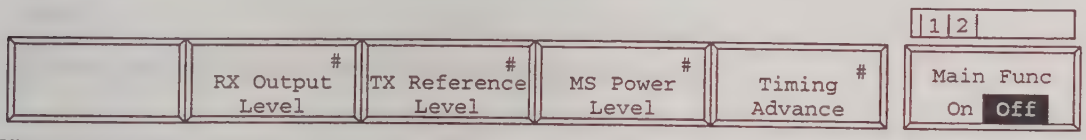

(4) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Communication




• 2nd page of the main function keys on the Sequence Monitor screen

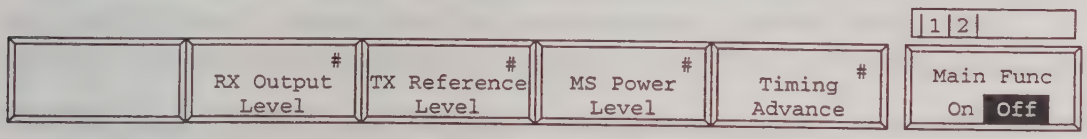
(1) When the RCA is the Call Processing status of Stop

• The set value of the RX Output Level is executed when the [Start]F5 key on the first page of the main function keys is pressed.

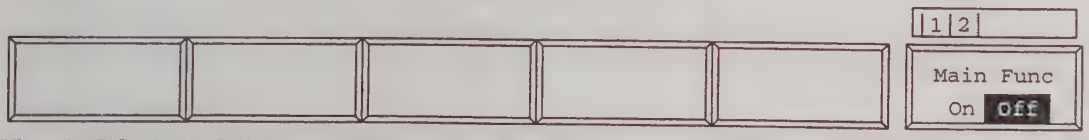



(2) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle

• The set value of the RX Output Level is executed, immediately.

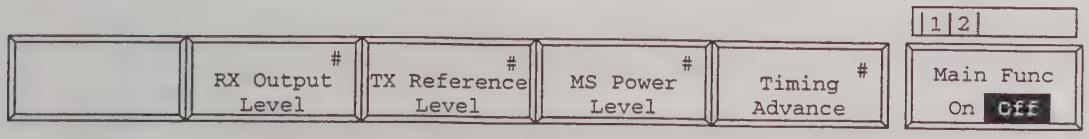



(3) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Paging, Radio Link, Registration, Origination, Termination, Hand Over, Disc from MS or Radio Disc.




(4) When the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Communication

• The set value of the RX Output Level is executed, immediately.




Notes: • Only the Time Alignment is a measured value, and others are the data from the MS.

• "Actual" indicates the actual data from the MS; "Ordered" indicates the setting values.

- Main function keys

1st page

| | |
|---|---|
| [ARFCN]F1 | Opens the channel-number changing window to change the channel (ARFCN: Air RF Channel).<br>Appears when the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle or Communication. |
| [Paging]F2 | Pages the MS (mobile system under test).<br>Appears when the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Idle. |
| [Discconnect From NT]F2 | Disconnects the MS from the network.<br>Appears when the RCA is the Call Processing status of Start, and the MS is the Call Processing status of Communication. |
| [Loop Back On Off]F4 | Turns on/off the loop-back (output) signal from the MS.<br>Appears when the RCA is the Call Processing status of Start, and the MS the Call Processing status of Communication. |
| [Start]F5 | Changes the RCA status from Stop to start.<br>Appears when the RCA is the Call Processing status of Stop. |
| [Stop]F5 | Changes the RCA status from Start to stop.<br>Appears when the RCA is the Call Processing status of Start. |

2nd page .... Appears when the RCA is the Call Processing status of Stop. Also appears when the RCA is the Call Processing status of Start and then the MS is the Call Processing status of Idle or Communication.

| | |
|---|---|
| [RX Output Level]F2 | Changes the reception level of the MS (i.e. the output level of the RCA). |
| [TX Reference Level]F3 | Changes the reference level of the RCA to measure the transmission level of the MS (i.e. the reception level of the RCA). |
| [MS Power Level]F4 | Changes the transmission level of the MS. |
| [Timing Advance]F5 | Changes the Timing Advance of the MS. |

• Function keys

[Scenario Load] F7 — Press to load down the new scenario file from the floppy disk.Loading down the new scenario file makes the operation of Call Processing change to other than the one at set the factory shipping.

[File No.] F9 — Opens the sub-window and displays the Scenario File number.

The new Scenario File (Note 1) is loaded down from the floppy disk choosing the file number to be loaded down in the sub-window.

The Scenario File set at the factory shipping in internal memory is loaded when the power is turned on. To use a Scenario File other than the one set at the factory shipping, it is necessary to load the desired Scenario File by this function after turning on the power.

0 to 99, Resolution: 1, Initial value: 0

[Default] F10 — Loads the Scenario File set at the factory shipping and returns to the standard Call Processing operation.

[Return] F12 — Returns to the previous menu.

[Back Screen] F12 — Displays the previous screen.

Note 1: Explanation of Scenario File number 00

Loading this Scenario File, the operation mode becomes able to change the Call Processing status of RCA without transmission with GSM moving terminal.
The frame synchronization of RF output is maintained even if the Call Processing status of the RCA is changed.
This operation mode is valid to measure DUT of the board level that is not completed.
[Stop→Idle status]: Press the [Start] F5 key when the RCA is the Call Processing status of Stop, and it changes to Idle.
RCA outputs RF signal that is modulated by the control channel data including broadcasting data. It is enable to test whether or not DUT can receive this RF signal and make synchronization in this status.
[Idle→Communication status]: Press the [Paging] F2 key when the RCA is the Call Processing status of Idle, and it changes to Communication.
RCA outputs RF signal that is modulated by loop back data for BER measurement.
When DUT receives this signal and return it to RCA as uploading RF signal with the same timing as a normal Call Processing mode, DUT without Call Processing function can perform the BER measurement.
[Communication→Idle status]: Press the [Disconnect from NW] F2 key when the RCA is in the Call Processing status of Communication, and it changes to Idle.
[Change to Stop status]: Press the [Stop] F5 key when the RCA is the Call Processing status of other than Stop, and it changes to Stop.
RF output of the RCA becomes Off in Stop status.

### 4.3.9 Saving and recalling parameter data: Save Parameter screen, Recall Parameter screen

Display the Save Parameter and Recall Parameter screens according to the following steps to save or recall parameters set for the transmitter and receiver test.

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on.<br>The first page of the Main Menu appears at the bottom of the screen. |
| 2. | [Recall]F4 | Sets Recall Parameter mode.<br>The Recall Parameter screen appears.<br>The Recall function key menu appears on F7 to F12. |
| 2' | [Save]F5 | Sets Save Parameter mode.<br>The Save Parameter screen appears.<br>The Save function key menu appears on F7 to F12. |

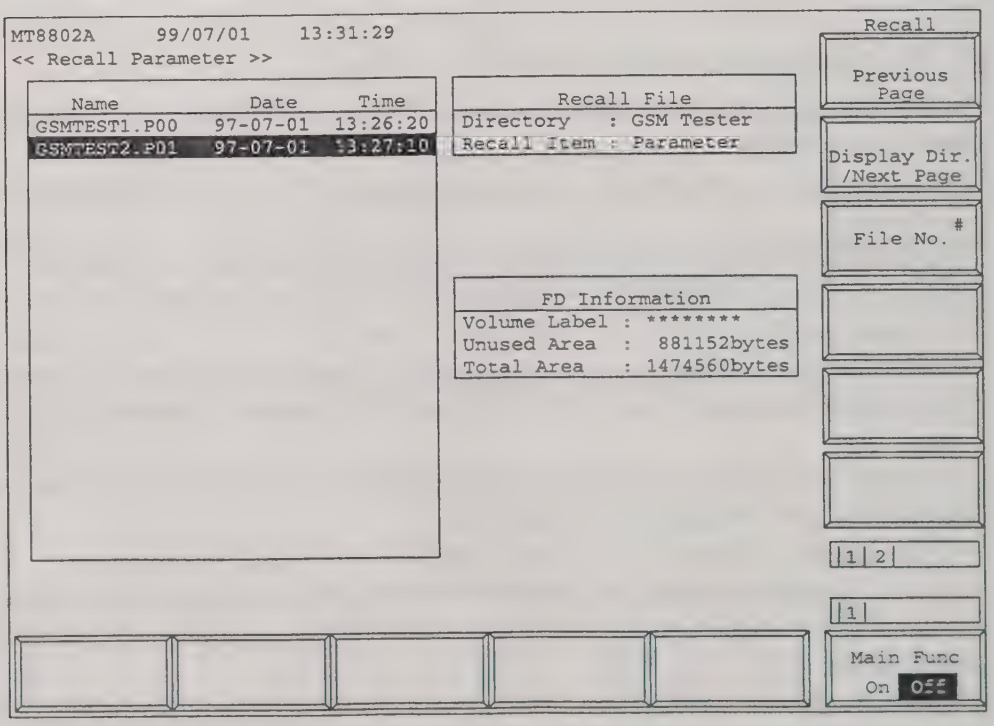



Fig. 4-31 Recall Parameter Screen

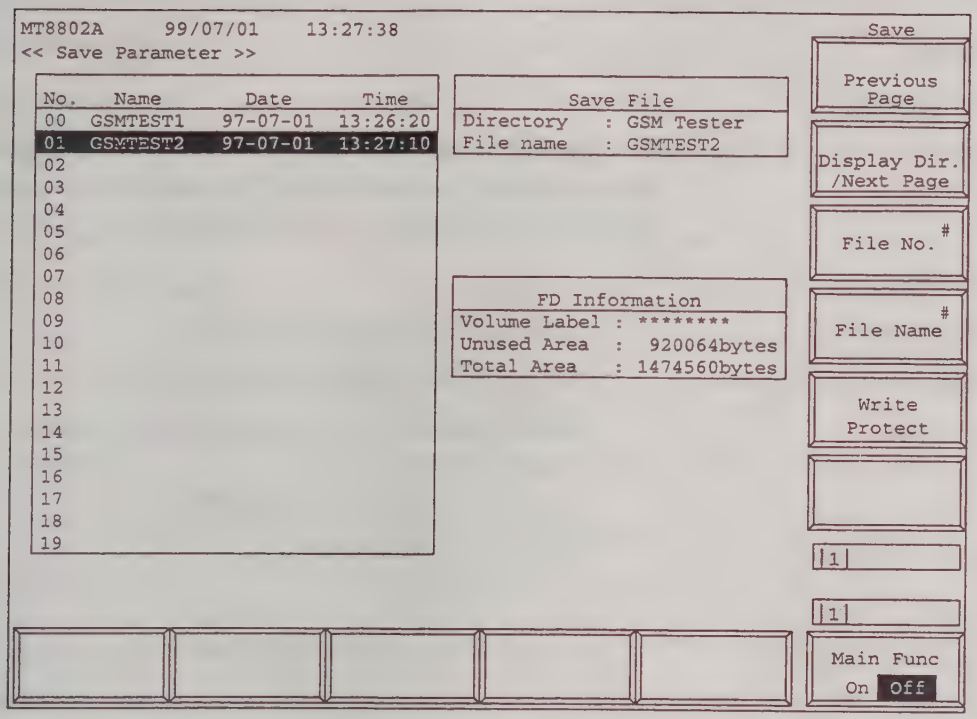



Fig. 4.32 Save Parameter Screen

- Floppy disk to be used:

  For saving and loading parameters and data, use the floppy disk described in Section 3. When the floppy disk is required to be formatted, use the File Operation screen in Paragraph 4.3.10.

- Notes when displaying the Save Parameter screen and Recall Parameter screen:

  Before pressing the [Save]F5 or [Recall]F4 function key, insert a floppy disk(FD) in the FD driver of the RCA. Then press the key. The RCA automatically starts the FD-driver operation.

- Screen display and function key display:

  Pressing the [Save]F5 or [Recall]F4 function key changes only the display of the F7 to F12 function keys.

  The screens (Figs. 4-31, 4-32) appear when the [Display Dir./Next Page] F8 key is pressed to display the contents of the FD. These screens also display the function keys used to select any directory and any file.

- Information to be saved and recalled:

  The [Save] and [Recall] keys on the main function keys saves and recalls the measurement parameters.

- Function keys on the Recall Parameter screen

Main function key: None

Recall function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The lower-order Recall menu appears. (This menu consists of two pages. Use the Next Menu [▲] key to scroll to the next page.)

** 1st page**

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter data file.
0 to 99, Resolution: 1, Initial value: 0

[Back Screen]F12: Displays the previous screen.

** 2nd page **

[Select Display Mode]F7: Displays the Display Mode menu to select a display mode.

[Wide]F7: Displays file numbers in ascending order from 0 regardless of whether all files are saved.

[Narrow]F8: Skips the numbers of files not saved and displays only the numbers of saved files in ascending order.

[return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter file.
0 to 99, Resolution: 1, Initial value: 0

[return]F12: Returns to the previous menu.

- Function keys on the Save Parameter screen

Main function key: None

Save function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The low-order Save menu appears.

- [Previous Page]F7: Displays the previous page of the directory.
- [Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.
- [File No.]F9: Opens the window for entering the save position (number) of the setup parameter data file.
  0 to 99, Resolution: 1, Initial value: 0
- [File Name]F10: Opens the window for entering the name of the parameter data file to be saved.
  The data file name consists of up to eight characters.
- [Write Protect]F11: Write-protects the specified parameter data file.
  An asterisk (*) is displayed at the end of the name of the write-protected file.
  If the specified parameter data file is already write-protected, this key cancels write protect.
  Note: This function can only be executed through panel operation.
- [Back Screen]F12: Displays the previous screen.

[return]F12: Returns to the previous menu.

• Saving parameters and data

This paragraph describes how to save the measurement parameters of the RCA to a floppy disk.

| Step | key operation | Description |
|---|---|---|
| 1. | | Insert a saving floppy disk(FD) into the FD driver on the bottom left of the RCA. |
| 2. | [Main Func on off]F6 | Sets Main Func to on. The Main Menu is displayed on the main function keys. |
| 3. | [Save] F5 | Changes to Save parameter mode.<br>Displays the Save function keys in F7 to F12, and then moves to the Save screen for parameter and data.<br>Searches the FD for parameter and data files, and displays them on the screen. |
| 4. | | Proceed to Step 5 below. |
| (Under state where the Save menu is displayed) | | |
| 5. | [Display Dir./Next Page]F8 | Displays existing files to check the number of the file to be saved. |
| 6. | [File Name]F10 | Sets the file name used for save within 8 alphanumeric characters if necessary. |
| 7. | | Check the number of the file to be saved and the file status (whether the file exists and whether the file is write-enabled).<br>To write-enable the file, proceed to Steps 8a and later. Otherwise, proceed to Step 9. |
| 8a. | Cursor [∧] and [∨] | Select the file to be write-enabled. |
| 8b. | [Write Protect] F11 | Write-enables the file for over-writing. |
| 9. | [File No.] F9 | Specify the number of the file to be saved. |
| 10. | [Set] | Saves the file. |
| 11. | [Back Screen]F12 | Returns to the previous screen. |

• Write-protecting or write-enabling the file to be saved

This paragraph describes how to write-protect or write-enable the file containing data in the Save screen.

| Step | key operation | Description |
|---|---|---|
| 1. | | Execute the Steps 1 to 4 of the saving procedure in the previous paragraph to display the Save menu. |
| 2. | [Display Dir./Next Page]F8 | Displays the existing files. Check the number of the file to be saved. |
| 3. | Cursor [∧], [∨] | Select the file to be write-enabled. |
| 4. | [Write Protect]F11 | Write-protects or write-enables the file to be saved. |
| 5. | [Back Screen]F12 | Returns to the previous screen. |

• Recalling parameters and data

This paragraph describes how to recall measurement parameters from the floppy disk.

| Step | key operation | Description |
|---|---|---|
| 1. | | Insert a recall floppy disk(FD) into the FD driver at the bottom left of the RCA. |
| 2. | [Main Func on off]F6 | Sets Main Func to on. Displays Main Menu on the main function keys. |
| 3. | [Recall]F5 | Changes to Recall Parameter mode. Displays the Recall function keys in F7 to F12, and moves to the Recall screen for parameter and data. Searches the FD for parameter and data files, and displays them on the screen. |
| 4. | | Proceed to Step 5 below. |
| (Under state where the Recall menu is displayed) | | |
| 5. | [Display Dir./Next Page]F8 | Displays the directory containing the file to be recalled. Check the file to be recalled. |
| 6. | Cursor[∧][∨] | Select the file to be recalled. |
| 7. | [File No.]F9 | Sets the number of any file to be recalled. |
| | (The file to be recalled can be specified by the file number, too.) | |
| 8. | [Set] | Confirms the file to be recalled. The RCA reads the specified file. Then, returns to the previous screen automatically. |

• Changing the recall-file display format(WIDE/NARROW)

This paragraph describes how to change the recall-file display format(WIDE/NARROW).

| Step | key operation | Description |
|---|---|---|
| 1. | | Execute the Steps 1 to 5 of the recalling procedure in the previous paragraph to display the recalled file. |
| 2. | Next Menu [∧] | Displays the second page of the function keys. |
| 3. | [Select Display Mode]F7 | Displays the file display format selection menu. |
| 4. | [Wide]F7 or [Narrow]F8 | Specify the display format. |
| 5. | [return]F12 | Returns to the previous menu. |

## 4.3.10 Operating the file: File Operation screen

To access the floppy disk and display the parameter file directory, delete or write-protect the parameter file, and initialize the floppy disk; display the File Operation screen according to the following steps.

Note: This function can only be executed through panel operation.

| Step | key operation | Description |
|---|---|---|
| 1. | [Main Func on off]F6 | Sets the Main Func on.<br>The Main Menu appears at the bottom of the screen |
| | Next Menu [◀ ] | Displays the second page of the Main Menu. |
| 2. | [File Operation]F4 | Sets File Operation mode.<br>The File Operation screen appears.<br>The File function key menu appears on F7 to F12. |

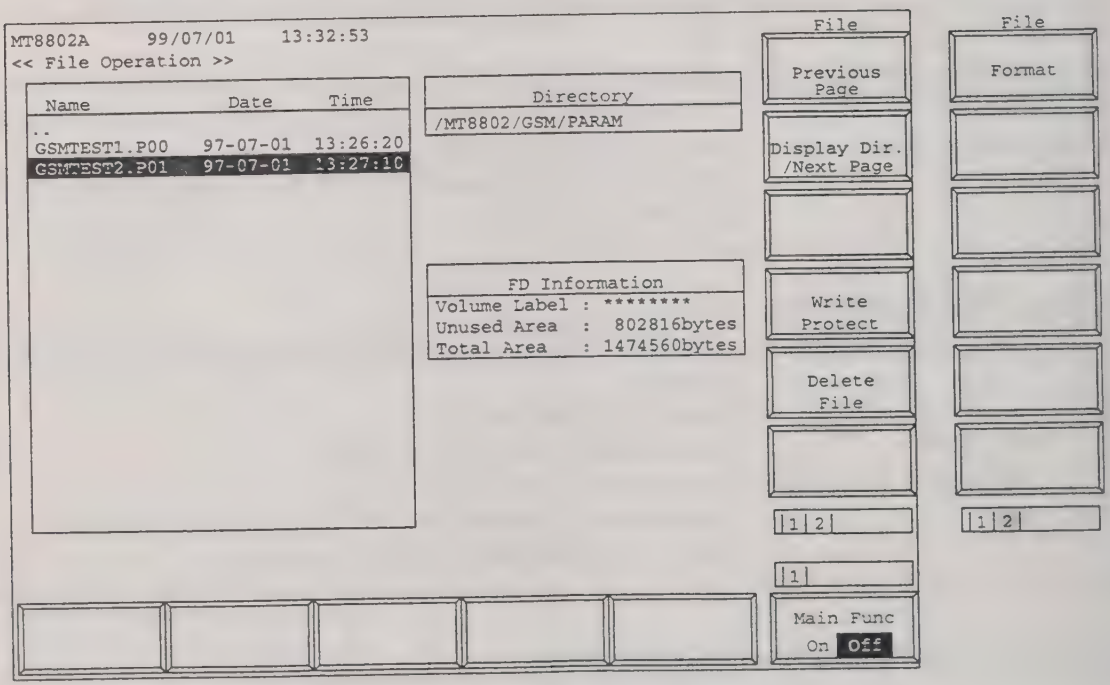



Fig. 4-33 File Operation Screen

Note: Use the floppy disk described in Section 3.

- Functions keys on the File Operation screen

Main function key: None

Function keys: 2 pages. Use the Next Menu [▲] key to scroll to the next page.

** 1st page **

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[Write Protect]F10: Write-protects the specified parameter data file.
An asterisk (*) is displayed at the end of the name of the write-protected file.
If the specified parameter data file is already protected, write protect can be canceled by pressing this key.

Note: This function can only be executed through panel operation.

[Delete File]F11: Opens the window for entering the position (number) of the parameter data file to be deleted.
Setup range: 0 to 99 (integer)
Initial value: 0

** 2nd page **

[Format]F7: Initializes the floppy disk to the specified type. The initialization format is MS-DOS 1.44 MB or 720 kB.

Note: The format is MS-DOS 1.44 MB or 720 kB. Use the 2HD or 2DD type of 3.5-inch floppy disk.

- Displaying files

This paragraph describes how to display the files in FD.

| Step | key operation | Description |
|---|---|---|
| 1. | | Insert a floppy disk(FD) into the FD driver at the bottom left of the RCA. |
| 2. | [Main Func on off]F6 | Turn the Main Func on to display the main function keys. |
| 3. | Next Menu [◀] | Displays the second page of the main function keys. |
| 4. | [File Operation]F4 | Moves to the File Operation screen. Accesses the FD to display the root directory. |
| 5. | Cursor [∧][∨] | Specify the directory to be required. |
| 6. | [Set] or [Enter] | Moves to the specified directory to display its contents. |
| 7. | | Repeat the Steps 5 and 6 above to display the required directory. |

Note: The sub-directories and file name under the selected directory are displayed in the frame on the left of the screen.
For directories, only their names are displayed in the "Name" field.
For files, Name/Date/Time are displayed.
The Directory field at the upper right of the screen displays the layer and location of the selected directory.

• Write-enabling/write-protecting files

This paragraph describes how to change the file write mode between the write-protected and write-enabled modes.

| Step | key operation | Description |
|---|---|---|
| 1. | | Select the directory of the desired file by the displaying-file procedure above. |
| 2. | Cursor [∧][∨] | Specify the file. |
| 3. | [Write Protect]F10 | Changes the file write mode. |

• Deleting files

This paragraph describes how to delete the parameter/data files.

| Step | key operation | Description |
|---|---|---|
| 1. | | Select the directory of the desired file by the displaying-file procedure above. |
| 2. | Cursor [∧][∨] | Specify the file. |
| 3. | [Delete File]F11 | Opens the confirmation window. |
| 4. | Cursor [∧][∨] | Select Yes or No. "Yes" deletes the specified file. |

Note: Once a file is deleted, it cannot be restored.

• Initializing(formatting) floppy disk

This paragraph describes how to initialize a floppy disk.

| Step | key operation | Description |
|---|---|---|
| 1. | | Insert a floppy disk(FD) into the FD driver at the lower left of the RCA.<br>The acceptable FD is the 2HD(1.44 M-bytes) or 2DD(720 k-bytes) type. |
| 2. | Next Menu [∧] | Displays the second page of the function keys. |
| 3. | [Format]F7 | Initializes the floppy disk. During initialization, a window indicating initialization appears on the screen. |
| 4. | Next Menu [∧] | Returns to the first page of the function keys. |

Note: Once a floppy disk is initialized, the data recorded on the disk is all lost.

### 4.3.11 Screen hard copy ... Copy

The copy function transfers a screen display to the printer or floppy disk. Specify a transfer destination and mode on the Instrument Setup screen. Press the Copy key on the front panel to activate the Copy function. While the Copy function is operating, operations (including remote control) such as measurement or internal setting are disabled.

#### (1) Transfer to the printer

If Copy is set to the printer on the Instrument Setup screen, screen display can be printed via the Parallel interface on the rear panel. Printers using the ESC/P command system can be used.

#### (2) Transfer to the floppy disk

If Copy is set to BMP on the Instrument Setup screen, the floppy disk driver on the front panel can be used to store data displayed on the screen in the floppy disk. Paragraph 4.3.10 describes the floppy disks that can be used. Data created on the floppy disk is the image file of the monochrome BMP data format. While the Copy is being executed, the name of the created file "RCA_***.BMP" is displayed on the bottom of the screen (*** is a number beginning with 000).

(Reference) Number of storable BMP files

2DD (720K bytes): Up to 18

2HD (1.44M bytes): Up to 37

## 4.3.12 5 Bands User Calibration

### (1) Features

- Supports individual 5 bands calibration.
- Freely sets both beginning and ending frequency of each band.
- Non volatile calibration value (No necessity to store into external PC's storage media).
- Needs only one GPIB command for compensating for RF power measurement drift.
- 5 bands User Calibration is available only by the GPIB commands.

### (2) Functions

Refer to the Operation Manual of Remote Control for the details of GPIB command.

### (3) TX Band (for TX measurement)

(a) Band definition

The each band can be defined by the following GPIB program messages.

Prog. Msg: DEFTXBAND n, F1, F2

n: 1 to 5 F1: Beginning Freq. [Hz] F2: Ending Freq.[MHz]

Query. Msg.:DEFTXBAND? n

Response: F1, F2

(b) User Calibration

In order to remove the effects of the cable loss and absolute error of RCA's Power sensor, it is necessary to calibrate the RCA built-in manufacturing system by using precise power source when constructing the manufacturing line.

The GPIB commands for writing initial calibration value are as follows.

Prog. Msg.: TXUSRCAL Band, CalValue

Band: 1 to 5, CalValue: -50.0 to +50.0 [dB] (Initial Setting = 0.0 [dB])

Query Msg.: TXUSRCAL? Band

Response: CalValue

(c) Drift compensation

Every specified time (e.g. 1 hour), it is desirable to compensate the RF power measurement by internal power sensor of the RCA. When using this function, the RCA requires calibration signal source which is higher than +10 dBm mean power connected to Main Input connector.

By sending the following GPIB command to the RCA, the RCA calculates the difference of Power measurement result between internal power sensor and DSP, and stores it as the drift compensation value of the current band.

Prog. Msg.: CMPTXPWR

Query Msg.: CMPTXPWR?

Response: Drift compensation value by "CMPTXPWR" Prog. Msg. [dB]

(d) Cancellation of drift compensation

The Drift compensation value stored by "CMPTXPWR" can be cleared by "CALCANCEL" command. (Clear current band only)

Prog. Msg.: CALCANCEL

### (4) RX Band (for RX measurement)

(a) Band definition

The each band can be set by the following GPIB program message.

Prog. Msg: DEFRXBAND n, F1, F2

n: 1 to 5 F1:Beginning Freq. [Hz] F2:Ending Freq.[Hz]

Query. Msg.: DEFRXBAND? n

Response: F1, F2

(b) User Calibration

In order to remove the effects of cable loss, it is necessary to calibrate the RCA built in manufacturing system by using precise power meter when constructing the manufacturing line.

GPIB command for writing initial calibration value are as follows.

Prog. Msg.: RXUSRCAL Band, CalValue

Band: 1 to 5, CalValue: -50.0 to +50.0 [dB] (Initial Setting = 0.0 [dB])

Query Msg.: RXUSRCAL? Band

Response: CalValue

(c) Calibration mode switch

The default calibration functionality is "2 bands User Calibration", which is displayed on Setup TX Parameter Screen and Setup RX Parameter Screen.

To enable "5 bands User Calibration", the following GPIB commands are required after on the RCA is switched on.

Prog. Msg.: CALMODE n

n: (0 = 2 bands mode, 1= Enhanced 5 bands Mode)

Query Msg.: CALMODE?

Response: n: (0 = conventional (default), 1= Enhanced 5 bands Calibration Mode)

## 4.3.13 Settings relating to remote control and panel key control

### 1. Remote control interfaces

The remote control interfaces of the RCA are classified into the GPIB interface and serial interface (RS-232C interface). Select an interface used on the Instrument Setup screen (see paragraph 4.3.3).

### 2. Remote control and panel control keys

The keys and lamps described in this section are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the RCA is controlled remotely using the GPIB interface. When the RCA is controlled remotely from an external controller via the GPIB interface, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. The LOCAL key is used to cancel the remote control status of the GPIB interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an incorrect operation on the front panel for automatic measurement or status holding. When the panel is locked, the red lamp on the PANEL LOCK key lights.

### 3. Remote control status

There are the following differences between control statuses of the two remote control interfaces that can be used with the RCA:

1) Remote control status by GPIB

If GPIB is used for remote control, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change the GPIB control status to the front panel entry status, execute the following steps:

1-1) Halt the GPIB control.

1-2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

2) Remote control status by RS-232C

If RS-232C is used for remote control, the REMOTE lamp on the left of the front panel does not light. During the remote control using RS-232C, key entry and rotary encoder entry from the front panel are enabled (remote control operations can be known by the change of display on the LCD screen). Therefore, during a remote control operation using RS-232C, be careful of incorrect operation caused by entry from the front panel.

# SECTION 5
# PERFORMANCE TESTS

This section lists the equipment used in performing the MT8802A performance tests, and explains the setup and the performance test items.

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## 5.1 Requirements for Performance Tests

The performance tests are carried out as a part of preventive maintenance to prevent deterioration of the MT8802A performance.

Use the performance test procedure during acceptance inspection, periodic inspection, and after repair to check the MT8802A performance. The items which is regarded important should be tested periodically as preventive maintenance. This section explains the following test procedures :

- Frequency/Residual phase error
- Output power measurement accuracy
- Carrier OFF power measurement
- Measurement range of modulation power and switching transients
- Phase error of signal generator

For the analog measurement performance test, see SECTION 5 "PERFORMANCE TEST" of the manual of the MT8802A main unit.

The performance is recommended to inspect regularly once or twice a year.
If the specifications are not met in the performance tests, contact the Service Department of Anritsu Corporation.

## 5.2 Instruments Required for Performance Test

The instruments required for performance test are shown below.

### Instruments Required for Performance Test

| Recommended instrument name (model name) | Required performance | Test item |
|---|---|---|
| Synthesized signal generator (MG3633A) | ¥ Frequency range: 100 MHz to 1 GHz 1-Hz resolution available<br>¥ Output level range: —20 to +10 dBm 0.1-dB resolution available<br>¥ SSB phase noise: Maximum —130 dBc/Hz (at 10 kHz offset)<br>¥ Second harmonics: Maximum —30 dBc<br>¥ External reference input: (10 MHz available) | Frequency/residual phase error |
| Digital modulation signal generator (MG3670B) | ¥ Frequency range: 300 kHz to 2250 MHz 1-Hz resolution available<br>¥ Output level range: —143 to +13 dBm 0.1-dB resolution available<br>¥ SSB phase noise: Maximum —120 dBc/Hz (at 100 kHz offset)<br>¥ Second harmonics: Maximum —30 dBc<br>¥ External reference input: 10 MHz or 13 MHz | Carrier OFF power measurement<br>Measurement range of modulation power and switching transients |
| Intelligent RF signal generator (HP8665B) | ¥ Frequency range: 100 MHz to 3000 MHz 0.01-Hz resolution available<br>¥ Output level range: —139.9 to +13 dBm 0.1-dB resolution available<br>¥ SSB phase noise: Maximum —117 dBc/Hz (at 20 kHz offset)<br>¥ Second harmonics: Maximum —30 dBc | Output power measurement accuracy |
| Fixed attenuator (MP721A) | ¥ Attenuation amount: 3 dB<br>¥ VSWR: Maximum 1.25 | Output power measurement accuracy |
| Digital mobile radio transmitter tester (MS8604A) | ¥ Vector error: Maximum 1.8% rms | Phase error of signal generator |

† Performances are partially extracted that can cover the measurement range of test items.

## 5.3 Performance Tests

Make sure to have the equipment to be tested and the measuring instruments have warmed up and completely stabilized for at least 30 minutes before starting the test unless otherwise specified. To perform the most accurate measurement, it is also necessary to test under the room temperature, obtain minimum fluctuation of AC supply voltage, and have no problem such as noise, vibration, dust and humidity.

### 5.3.1 Frequency/residual phase error

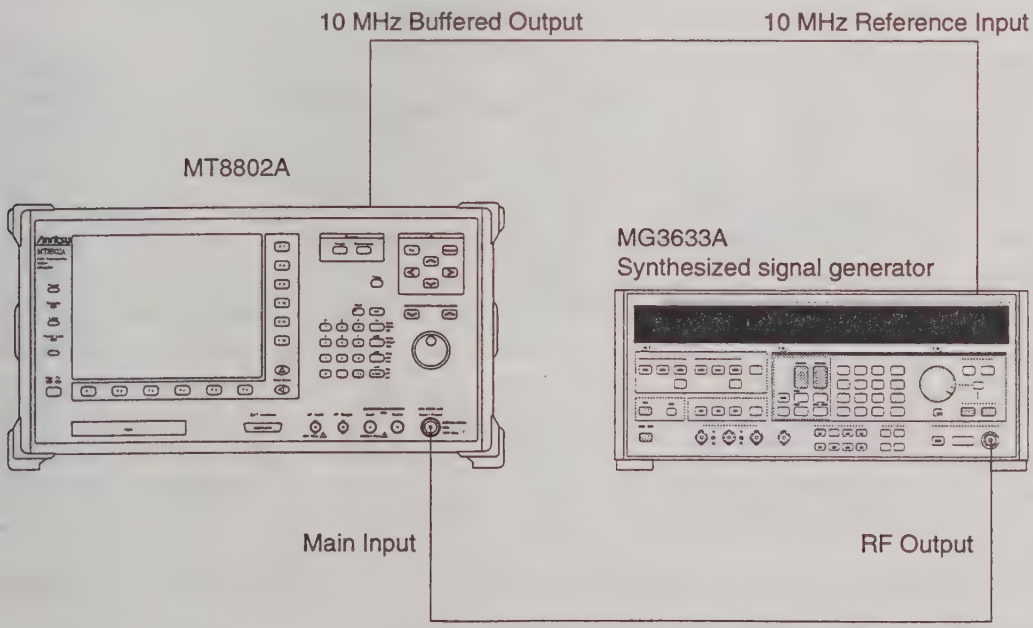
(1) Specifications

- Carrier frequency accuracy : ± (Accuracy of reference crystal oscillator +10 Hz)
- Residual phase error : ≤0.5-degree rms, ≤2-degree peak

(2) Test instruments

- Synthesized signal generator : MG3633A or the equivalent

(3) Setup



(4) Test procedures : Frequency/residual phase error

| Step | Procedure |
|---|---|

1. Initialize the MT8802A and the signal generator (press the Preset key).
2. Set the signal generator *1 as follows :
   Frequency : Frequencies in the table *2 +67.70833 kHz *3
   No modulation
   Level : +10 dBm
3. Set the MT8802A as follows :

| | | |
|---|---|---|
| RF Input/Output : | Main | Set it on the Instrument Setup screen. |
| DUT Control : | None | Set it on the Setup Common Parameter screen. |
| TX Measure Ref level : | +10 dBm | Set it on the Setup Common Parameter screen. |
| Measuring Object : | Continuous | Set it on the Setup Common Parameter screen. |
| TX Measure Frequency : | Frequencies in the table | Set it on the Setup Common Parameter screen. |

4. Connect the signal generator output to the Main connector of MT8802A.
5. Display the Modulation Analysis screen of MT8802A and execute "Measure Single."
6. Read the values of "Carrier Frequency Error," "RMS phase error," and "Peak phase error."
7. Perform the similar measurement for each of frequencies.

## Frequency/residual phase error

| | | 10 MHz | 900 MHz | 1.8 GHz | 2.2 GHz |
|---|---|---|---|---|---|
| Frequency accuracy | Effective lower limit | –9.9 Hz | –9.9 Hz | –9.9 Hz | –9.9 Hz |
| | Actual measurement value | _____ Hz | _____ Hz | _____ Hz | _____ Hz |
| | Effective upper limit | +9.9 Hz | +9.9 Hz | +9.9 Hz | +9.9 Hz |
| | Measurement uncertainty | ±0.1 Hz | ±0.1 Hz | ±0.1 Hz | ±0.1 Hz |
| RMS phase error | Effective lower limit | 0.00 | 0.00 | 0.00 | 0.00 |
| | Actual measurement value | _____ | _____ | _____ | _____ |
| | Effective upper limit | 0.50 | 0.50 | 0.50 | 0.50 |
| Peak phase error | Effective lower limit | 0.00 | 0.00 | 0.00 | 0.00 |
| | Actual measurement value | _____ | _____ | _____ | _____ |
| | Effective upper limit | 2.00 | 2.00 | 2.00 | 2.00 |

Note) *1 Typical values of residual phase error of signal generator is the 0.2-degree rms and the 0.5-degree peak.

*2 See the table above.

*3 Frequency deviations are as shown below when the modulation data are All 1.

67.70833 kHz = Bit rate/4 = 270.833 kHz/4

## 5.3.2 Output power measurement accuracy

Power measurement is tested using the no-modulation continuous wave of signal generator.

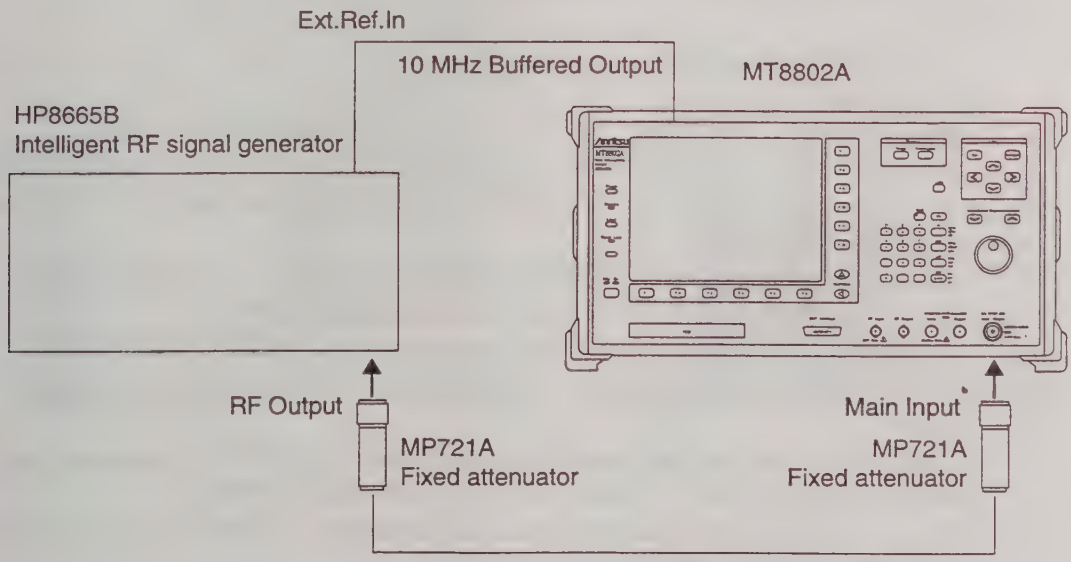
### (1) Specifications

- Output power accuracy : After the calibration using the built-in power meter,
  Accuracy : ±0.4 dB (+10 to +40 dBm at the Main connector)
  ±0.7 dB (–5 to +40 dBm at the Main connector)

### (2) Test instruments

- Intelligent RF signal generator : HP8665B or the equivalent
- Fixed attenuator : MP721A or the equivalent
- Power meter : ML4803A or the equivalent

### (3) Setup



(4) Test procedures : Output power measurement accuracy

| Step | Procedure |
|---|---|

Pre-calibration

1. Initialize the signal generator and the power meter.
2. Perform the zero/calibration adjustments of power meter if required.
3. Set the measurement frequency and the appropriate calibration factor for the signal generator and the power meter, respectively.
4. Set the output level of signal generator at "+10 dBm (for the Pad loss)." Adjust the output level of signal generator so that the power meter measurement value becomes "+10 dBm ± 0.06 dB." Record the set value of signal generator (SET cf, n) and the power meter measurement value (READ cf, n) at this time.
5. Similarly calibrate the signal generator at all the measurement levels.
6. Change the measurement frequency of signal generator and the calibration factor of power meter and similarly repeat the measurement steps 4 and 5.

Measurement

7. Initialize the MT8802A (press the Preset key).
8. Set the MT8802A as follows :

| | | |
|---|---|---|
| RF Input/Output : | Main | Set it on the Instrument Setup screen. |
| Measuring Object : | Continuous | Set it on the Setup Common Parameter screen. |

9. Set the measurement frequency for the MT8802A and the signal generator and turn OFF the signal generator output.
10. Display the Power Meter screen of MT8802A and execute "Zero Set" in the no-input status.
11. Display the RF Power screen of MT8802A and turn ON the signal power output.
12. Set the MT8802A RF Level at +10 dBm. Set the calibrated output level for signal generator.
13. Execute "Adjust Range" and "Manual Calibration" of MT8802A and read the measured result of "TX Power."
14. Calculate the accuracy using the power meter measurement result (READ f, n) at calibration and the measured result of the step 13. Check whether they satisfy the specifications.
15. Change the output level of signal generator and the reference level of MT8802A and similarly repeat the measurement steps 13 and 14.
16. Change the measurement frequency and similarly repeat the measurement steps 9 to 15.
17. Turn OFF the output of the signal generator.

## Output power measurement accuracy

| Main | 10 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|
| +10 dBm | _____ dB | _____ dB | _____ dB | _____ dB | ±0.16 dB | –0.24 dB | +0.24 dB |
| 0 dBm | _____ dB | _____ dB | _____ dB | _____ dB | | –0.54 dB | +0.54 dB |
| –5 dBm | _____ dB | _____ dB | _____ dB | _____ dB | | | |

## 5.3.3 Carrier OFF power measurement

(1) Specifications

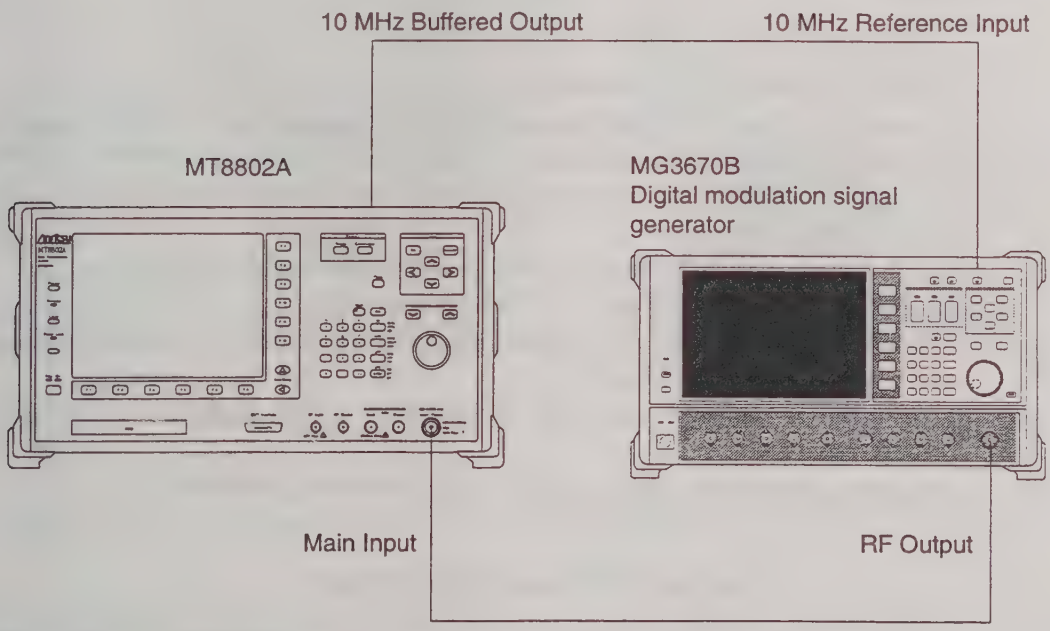
- Normal mode : Measurement range : ≥55 dB (+10 to +40 dBm in comparison with average power in the burst)
- Wide dynamic range mode : Measurement range : ≥80 dB (–5 to +40 dBm in comparison with average power in the burst)

(Average noise level (≤ –50 dBm at 100 MHz to 2.2 GHz) determines the measurement limit.)

(2) Test instrument

- Digital modulation signal generator : MG3670B or the equivalent

(3) Setup



(4) Test procedures : Carrier OFF power measurement

| Step | Procedure |
|---|---|

1. Initialize the MT8802A and the signal generator (press the Preset key).
2. Set the MT8802A as follows :

| | | |
|---|---|---|
| RF Input/Output : | Main | Set it on the Instrument Setup screen. |
| TX Measure Ref Level : | +10.0 dBm | Set it on the Setup Common Parameter screen. |
| Measuring Object : | MS-NB | Set it on the Setup Common Parameter screen. |
| Storage Mode : | Normal | Set it on the RF Power screen. |

3. Set the signal generator as follows :

| | |
|---|---|
| Modulation : | On |
| Output Level : | +10 dBm |
| System : | GSM |
| Differential Encoding : | On |
| Burst : | On |
| Pattern : | TCH |
| Burst Trigger : | Int |

4. Display the RF Power screen of MT8802A.
5. Execute "Adjust Range," "Manual Calibration," and then "Measure Single" of MT8802A after setting frequency for the signal generator and the TX Frequency of MT8802A to measurement frequency.
6. Read the "On/Off ratio" value displayed on MT8802A to check whether it is larger than or equal to the specification value.
7. Change the measurement frequency and repeat the above measurement steps 5 and 6.
8. Change "Storage Mode" of MT8802A to "Wide Dynamic Range."
9. Execute "Adjust Range," "Manual Calibration," and then "Measure Single" after setting measurement frequencies for each of instruments.
10. Read the "Carrier Off Power" value displayed on MT8802A to check whether it is larger than or equal to the specification value.
11. Change the measurement frequency and repeat the above measurement steps 8 to 10.

## Carrier OFF power measurement

| | 10 MHz | 100 MHz | 900 MHz | 1.8 GHz | 2.1 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|---|---|
| Normal mode measurement range in dB | ——— | - - - - | ——— | ——— | - - - - | ——— | ±1 dB | 56 dB | - - - - |
| Wide-dynamic average-noise level in dBm | - - - - | ——— | ——— | ——— | ——— | - - - - | | - - - - | –51 dBm |

## 5.3.4 Measurement range of modulation power and switching transients

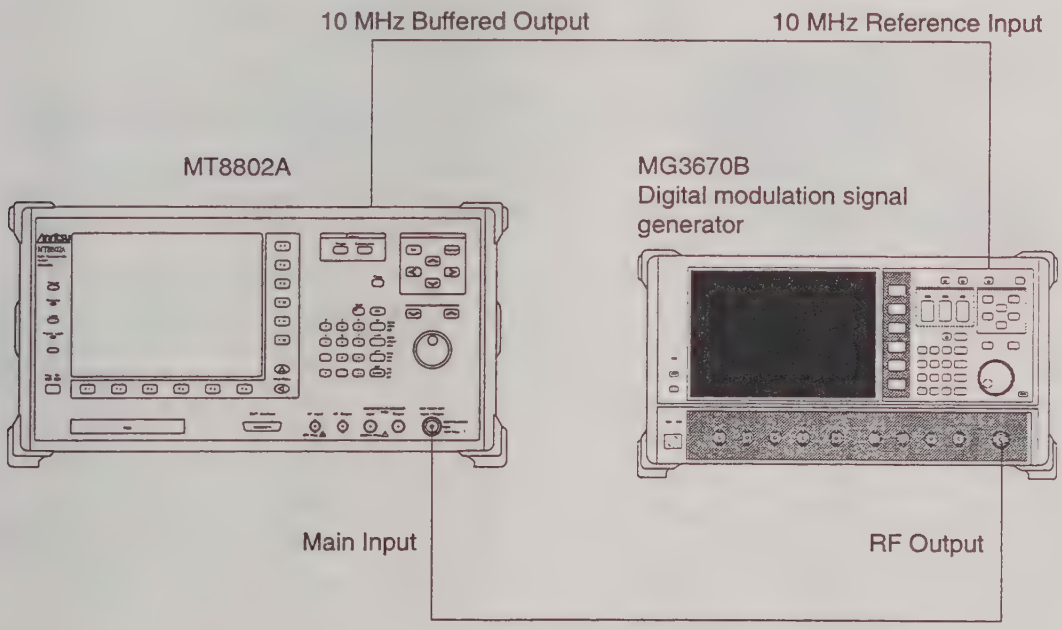
(1) Specifications

- Modulation power measurement range : ≥50 dB (200 kHz detuning)
  ≥66 dB (≥250 kHz detuning)
- Switching transients measurement range : ≥57 dB ( ≥400 kHz detuning)

(2) Test instrument

- Digital modulation signal generator : MG3670B or the equivalent

(3) Setup



(4) Test procedures : Measurement range of modulation power and switching transients

| Step | Procedure |
|---|---|

1. Initialize the MT8802A and the signal generator (press the Preset key).
2. Set the MT8802A as follows :

| | | |
|---|---|---|
| RF Input/Output : | Main | Set it on the Instrument Setup screen. |
| TX Measure Ref Level : | +10 dBm | Set it on the Setup Common Parameter screen. |
| Measurement Object : | Continuous | Set it on the Setup Common Parameter screen. |

3. Display the Output RF Spectrum screen of MT8802A.
4. Set the signal generator as follows :
   Output Level : +13 dBm
5. Set the measurement frequencies for the MT8802A and the signal generator.
6. Execute "Adjust Range" and "Manual Calibration" of MT8802A.
7. Execute "Measure Single" of MT8802A. Read the worse value of displayed upper and lower values (Modulation Power and Switching Transients) to check whether they satisfy specification values.
8. Similarly, perform the steps for each of frequencies in the table below.

Modulation power

| | 100 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit |
|---|---|---|---|---|---|---|
| 200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | ±1 dB | –51 dB |
| 250 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | –67 dB |
| 1200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 2000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |

Measurement uncertainty

| | 100 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit |
|---|---|---|---|---|---|---|
| 400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | ±1 dB | –58 dB |
| 600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 2000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |

## 5.3.5 Phase error of signal generator

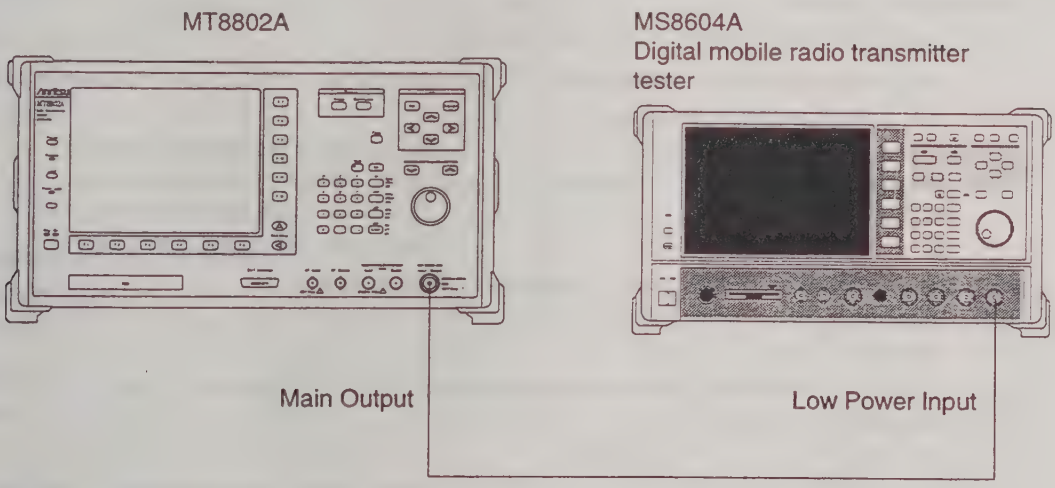
(1) Specifications

- Phase error : ≤2 degrees rms

(2) Test instrument

- Digital mobile radio transmitter tester : MS8604A or the equivalent

(3) Setup



### (4) Test procedures : Phase error of signal generator

| Step | Procedure |
|---|---|

1. Initialize the MT8802A and the transmitter tester.
2. Set the MT8802A as follows :

   RF Input/Output : Main — Set it on the Instrument Setup screen.
   RX Measure Output Level : –18 dBm — Set it on the Setup Common Parameter screen.
3. Set RF Input to Low on the System screen of transmitter tester and return to the Setup Parameter screen.

Measurement at Burst Off

4. Set the MT8802A as follows :

   Measuring Object : Continuous — Set it on the Setup Common Parameter screen.
5. Set the transmitter tester as follows :

   System : Universal — Set it on the Setup Parameter screen.
   Measuring Object : Continuous — Set it on the Setup Parameter screen.
   Bit Rate : 270.8333 kHz — Set it on the Setup Parameter screen.
   BT : 0.3 — Set it on the Setup Parameter screen.
6. Display the Bit Error Rate screen of MT8802A to set as follows :

   Modulation : On
   Level : On
7. Display the Modulation Analysis screen after setting the transmitter tester as follows :

   Differential Encoding : On
   RF Level : –18 dBm
8. Execute "Measure Single" of transmitter tester after setting measurement frequencies for each of instruments.
9. Read the "Phase Error" value displayed on the transmitter tester screen to check whether it is within the specification value.
10. Change the measurement frequency and repeat the above measurement steps 8 and 9.

Measurement at Burst On

11. Set the MT8802A as follows :

    Measuring Object : MS-NB — Set it on the Setup Common Parameter screen.
    TS : TSC0 — Set it on the Setup Common Parameter screen.
12. Set the transmitter tester as follows :

    System : GSM — Set it on the Setup Parameter screen.
    Measuring Object : MS-NB — Set it on the Setup Parameter screen.
    Sync Word Pattern : TSC0 — Set it on the Setup Parameter screen.
13. Similarly perform the above measurement steps 6 to 10 to check whether the value meets the specification.
14. Turn Off "Modulation" and "Level" of MT8802A.

### Phase error of signal generator

| | 10 MHz | 900 MHz | 1.8 GHz | 3 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|
| Burst Off | _____ % | _____ % | _____ % | _____ % | ≤0.5° rms | 0 % | 2 % |
| Burst On | _____ % | _____ % | _____ % | _____ % | | | |

## 5.3.6 Example of performance test result entry sheet

This paragraph gives an example of sheets used to summarize the test results before conducting the performance test of the MT8802A radio communication analyzer.
Use a copy of this sheet for the performance test.

Test location _____ Report No. _____
_____ Date _____
_____ Person in charge of the test _____
Device name: MT8802A Radio Communication Analyzer
MX880215A GSM Measurement Software
Manufacturing No. _____ Ambient temperature _____ °C
Power frequency _____ Hz Relative humidity _____ %
Remarks _____
_____
_____

### 1. Frequency/residual phase error

| | | 10 MHz | 900 MHz | 1.8 GHz | 2.2 GHz |
|---|---|---|---|---|---|
| Frequency accuracy | Effective lower limit | –9.9 Hz | –9.9 Hz | –9.9 Hz | –9.9 Hz |
| | Actual measurement value | _____ Hz | _____ Hz | _____ Hz | _____ Hz |
| | Effective upper limit | +9.9 Hz | +9.9 Hz | +9.9 Hz | +9.9 Hz |
| | Measurement uncertainty | ±0.1 Hz | ±0.1 Hz | ±0.1 Hz | ±0.1 Hz |
| RMS phase error | Effective lower limit | 0.00 | 0.00 | 0.00 | 0.00 |
| | Actual measurement value | _____ | _____ | _____ | _____ |
| | Effective upper limit | 0.50 | 0.50 | 0.50 | 0.50 |
| Peak phase error | Effective lower limit | 0.00 | 0.00 | 0.00 | 0.00 |
| | Actual measurement value | _____ | _____ | _____ | _____ |
| | Effective upper limit | 2.00 | 2.00 | 2.00 | 2.00 |

### 2. Output power measurement accuracy

| Main | 10 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|
| +10 dBm | _____ dB | _____ dB | _____ dB | _____ dB | ±0.16 dB | –0.24 dB | +0.24 dB |
| 0 dBm | _____ dB | _____ dB | _____ dB | _____ dB | | –0.54 dB | +0.54 dB |
| –5 dBm | _____ dB | _____ dB | _____ dB | _____ dB | | | |

### 3. Carrier OFF power measurement

| | 10 MHz | 100 MHz | 900 MHz | 1.8 GHz | 2.1 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|---|---|
| Normal mode measurement range in dB | _____ | - - - - | _____ | _____ | - - - - | _____ | ±1 dB | 56 dB | - - - - |
| Wide-dynamic average-noise level in dBm | - - - - | _____ | _____ | _____ | _____ | - - - - | | - - - - | –51 dBm |

4. Measurement range of modulation power and switching transients

Modulation power

| | 100 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit |
|---|---|---|---|---|---|---|
| 200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | ±1 dB | +51 dB |
| 250 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | +67 dB |
| 400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 2000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |

Measurement uncertainty

| | 100 MHz | 900 MHz | 1.8 GHz | 2.2 GHz | Measurement uncertainty | Effective lower limit |
|---|---|---|---|---|---|---|
| 400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | ±1 dB | +58 dB |
| 600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1200 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1400 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1600 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 1800 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |
| 2000 kHz | _____ dB | _____ dB | _____ dB | _____ dB | | |

5. Phase error of signal generator

| | 10 MHz | 900 MHz | 1.8 GHz | 3 GHz | Measurement uncertainty | Effective lower limit | Effective upper limit |
|---|---|---|---|---|---|---|---|
| Burst Off | _____ % | _____ % | _____ % | _____ % | ≤0.5° rms | 0 % | 2 % |
| Burst On | _____ % | _____ % | _____ % | _____ % | | | |

## 5.4 About Service

If the machine is fractured or does not operate as specified, contact the head office, a branch office, a sales office, a local office, or Customer Service Department of Anritsu Corporation to ask the repair. Addresses and telephone numbers are described on the back cover.

Provide the following information when asking the repair :

(a) Machine name and number described on the back panel.

(b) Malfunction status

(c) Contact person to check the malfunction contents or to inform the repair completion.

# SECTION 6
# CALIBRATION

This section describes the measuring instruments required to calibrate the MT8802A, and the setup and calibration method for these instruments.

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## 6.1 Calibration Requirements

Calibration is done to help maintain the MT8802A's performance.

Calibration should be performed periodically even if the MT8802A is operating normally.

We recommend that the MT8802A be calibrated once or twice a year.

Contact the Service Department of Anritsu Corporation if the MT8802A fails to meet the specifications during calibration.

## 6.2 Equipment Required for Calibration

The table below shows the equipment required to calibrate each item.

Table 6.1 Equipment Required for Calibration

| Recommended equipment | Required performance† | Calibration item |
|---|---|---|
| Frequency counter (MF1603A) | • 100 kHz to 3 GHz<br>• Resolution: 1 Hz<br>• External reference input: 10 MHz | Frequency accuracy of reference crystal oscillator |
| Frequency standard | Standard radio-wave receiver or equipment having equivalent function (accuracy better than $1 \times 10^{-9}$) | Frequency accuracy of reference crystal oscillator |

† Extracts part of performance which can cover the measurement range of the test item.

## 6.3 Calibration

Do not start the performance tests until the MT8802A and measuring instruments have warmed up for at least 24 hours and they have stabilized completely. To obtain the best measurement accuracy, do the calibration at room temperature. Keep AC power voltage fluctuations, noise, vibration, dust, humidity, and any other facxtors which can affect results to a minimum.

### 6.3.1 Calibrating the reference crystal oscillator

The stability of the MT8802A reference crystal oscillator is $\pm 2 \times 10^{-8}$/day. Calibrate the frequency of the reference crystal oscillator by using a reference signal generator generating a reference signal that is either locked to a standard wave or to the sub-carrier of a TV broadcast on a color TV (the sub-carrier will be locked to a rubidium atomic standard).

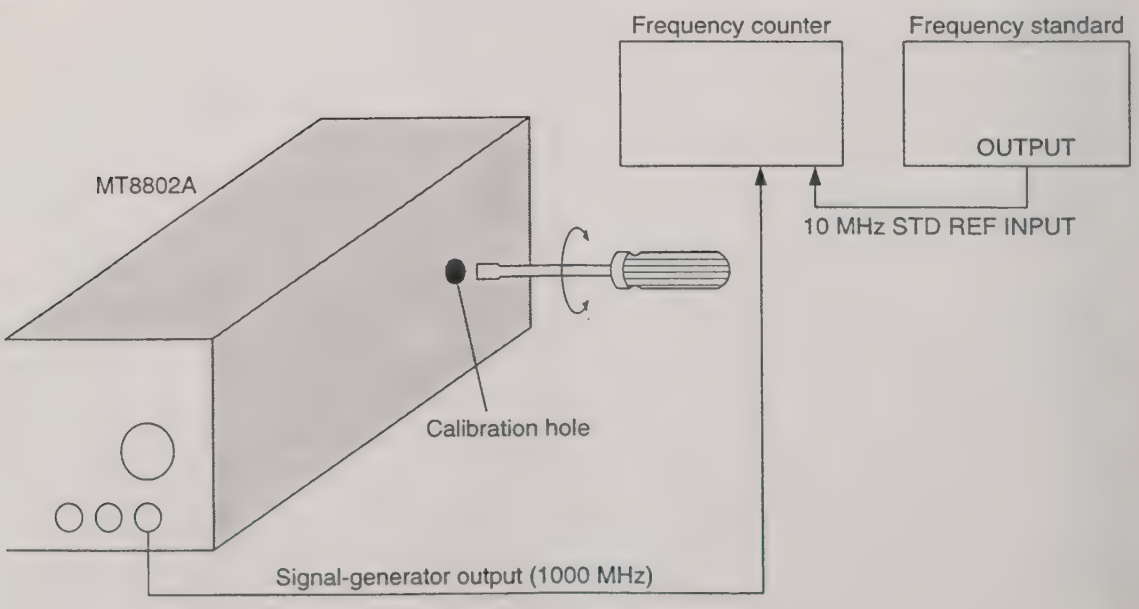
(1) Specifications

| Reference oscillator | Frequency | Aging rate | Temperature characteristics |
|---|---|---|---|
| Standard type (after 24-hour operation) | 10MHz | $2 \times 10^{-8}$/day | $\pm 5 \times 10^{-8}$ (0°C to 50°C) |

(2) Instruments required for calibration

- Frequency counter: 10 MHz external reference input, resolution: 1 Hz
- Frequency standard: Standard radio-wave receiver or equipment having equivalent function (accuracy better than $1 \times 10^{-9}$)

(3) Setup



(4) Calibration procedure

| Step | Procedure |
|---|---|
| 1. | Setup the equipment as shown in the figure above. The ambient temperature must be 23°C ± 5°C. |
| 2. | Set the Power switch on the rear panel to On and the Power switch on the front panel to the Standby position. Then, allow the MT8802A reference crystal oscillator to warm-up for 24 hours. |
| 3. | Set the Power switch on the MT8802A front panel to On. |
| 4. | Apply the standard frequency signal to the external reference input of the frequency counter. |
| 5. | Set the frequency of the signal generator of the MT8802A to 1 000.000 000 MHz, the level to –28 dBm, and the modulation to off. |
| 6. | Adjust the calibration trimmer of the crystal oscillator so that the frequency-counter reading is 1 000.000 000 MHz ± 10 Hz. |

# SECTION 7
# STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking, and transportation of the MT8802A and the regular maintenance procedures.

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7.3.1 Repacking ..... 7-4
7.3.2 Transportation ..... 7-4

## 7.1 Cleaning the Cabinet

Always turn the MT8802A power switch OFF and disconnect the power plug from the AC power inlet before cleaning the cabinet. To clean the external cabinet:

- Use a soft, dry cloth.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage. Then, use a soft, dry cloth to wipe the instrument dry.
- If loose screws are found, tighten them with the appropriate tools.

**CAUTION ⚠**

Never use benzine, thinner, or alcohol to clean the cabinet; these chemicals may damage the coating or cause deformation or discoloration.

## 7.2 Storage Precautions

This paragraph describes the procedures for long-term storage of the MT8802A.

### 7.2.1 Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other contaminants off the MT8802A.

(2) Avoid storing the MT8802A where it may be exposed to:

1) Direct sunlight or high dust levels.

2) High humidity.

3) Active gasses or acid.

4) The following temperatures or humidity:

- Temperature: ..... > 60°C, < -20°C
- Humidity: ..... ≥ 90%

### 7.2.2 Recommended storage conditions

The recommended storage conditions are as follows:

- Temperature: ..... 0 to 30°C
- Humidity: ..... 40% to 80%
- Stable temperature and humidity over a 24-hour period.

## 7.3 Repacking and Transportation

Take the following precautions if the MT8802A must be returned to Anritsu Corporation for servicing.

### 7.3.1 Repacking

Use the original packing materials. If the MT8802A is packed in other materials, observe the following packing procedure:

(1) Wrap the MT8802A in a plastic sheet or similar material.

(2) Use a cardboard box, wooden box, or aluminum case which allows shock-absorbing material to be inserted on all sides of the MT8802A.

(3) Use enough shock-absorbing material to protect the MT8802A during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape, or bands.

### 7.3.2 Transportation

Do not subject the MT8802A to severe vibration during transport. Also, transport under the storage conditions recommended in paragraph 7.2.

# APPENDIXES

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Appendix-II.

# APPENDIX A SCREEN AND FUNCTION KEY TRANSITION DIAGRAMS

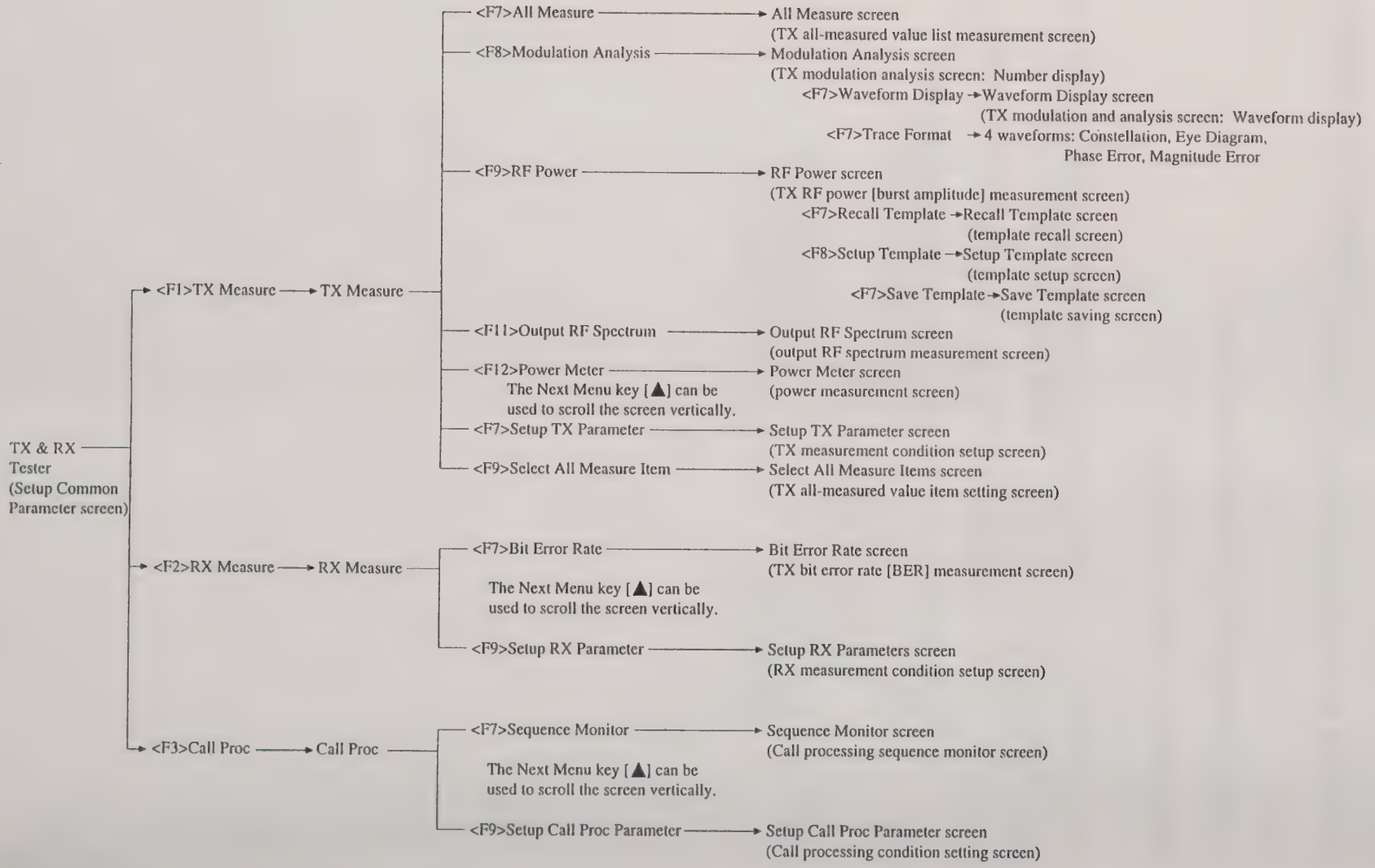
This appendix gives the screen and function-keys transition diagrams.

[Screen transitions] ..... See Paragraph 3.2.

- On any type of screen, the main menu shown below can be displayed by turning the [Main Func On Off] (F6) key to On. When main function keys F1 to F5 and Next Menu key [◀ ] are used to select a main menu item, the screen transits to the corresponding screen or key menu.

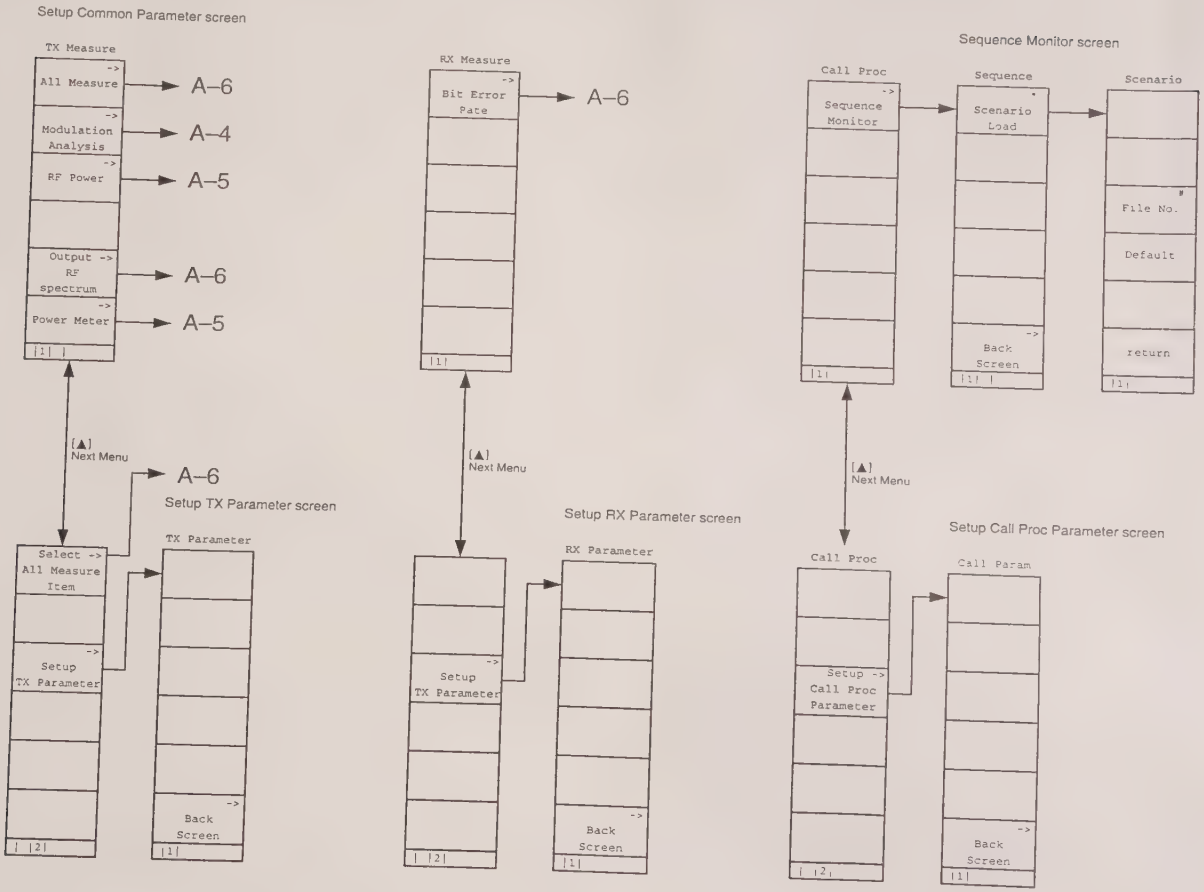
  Note: Change Color is a function key menu, so there is no corresponding screen.

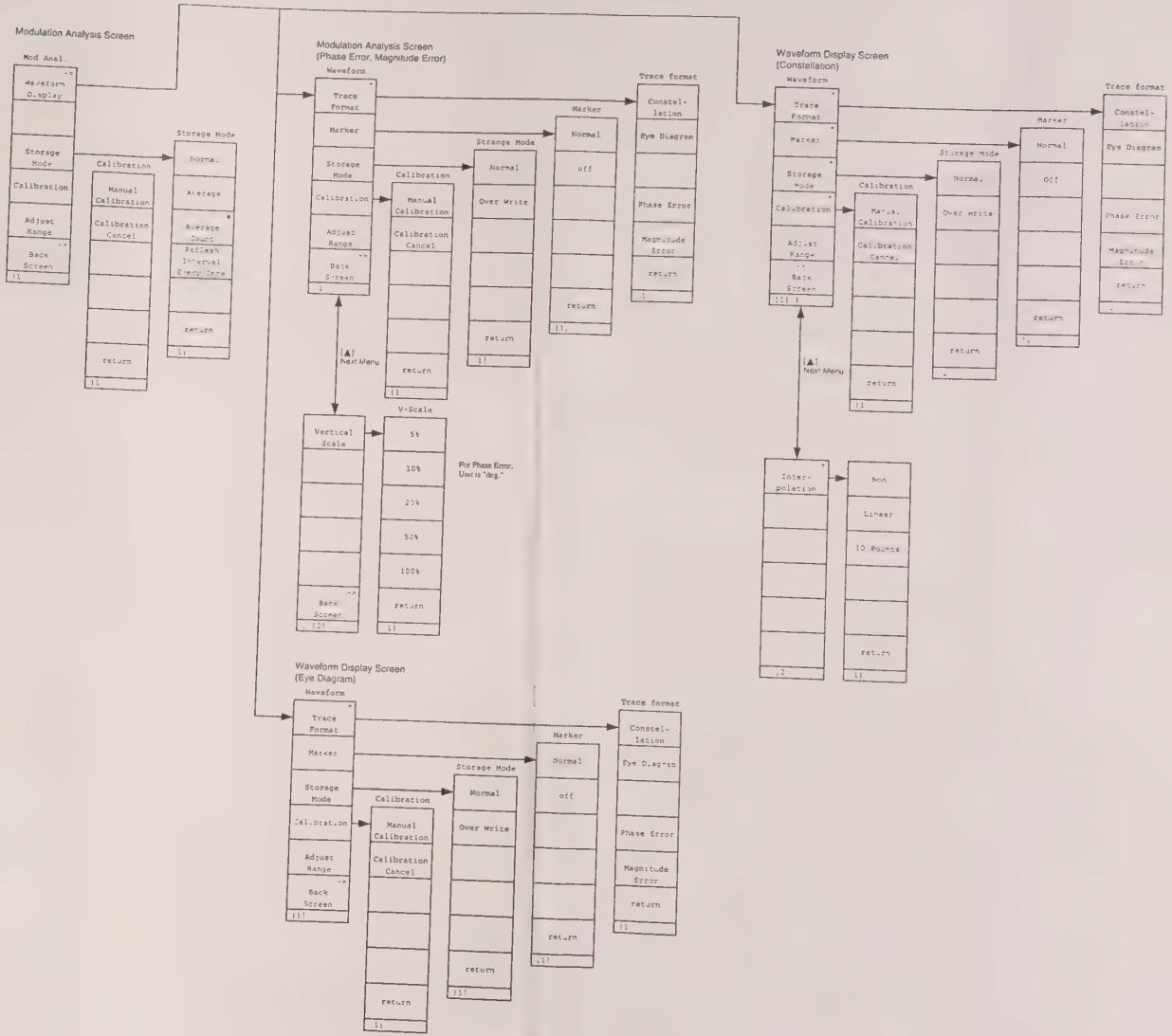
<F1>TX&RX Tester ——→ Setup Common Parameter screen
<F4>Recall ——→ Recall Parameter screen
<F5>Save ——→ Save Parameter screen
(The screen can be scrolled vertically using the Next Menu key [◀ ].)
<F1>Change System ——→ Change System screen
<F2>Instrument Setup ——→ Instrument Setup screen
<F3>Change Color ——→ Change Color menu
<F4>File Operation ——→ File Operation screen


TX & RX Tester (Setup Common Parameter screen)
<F1>TX Measure
TX Measure
<F7>All Measure
All Measure screen
(TX all-measured value list measurement screen)
<F8>Modulation Analysis
Modulation Analysis screen
(TX modulation analysis screen: Number display)
<F7>Waveform Display
Waveform Display screen
(TX modulation and analysis screen: Waveform display)
<F7>Trace Format
4 waveforms: Constellation, Eye Diagram, Phase Error, Magnitude Error
<F9>RF Power
RF Power screen
(TX RF power [burst amplitude] measurement screen)
<F7>Recall Template
Recall Template screen
(template recall screen)
<F8>Setup Template
Setup Template screen
(template setup screen)
<F7>Save Template
Save Template screen
(template saving screen)
<F11>Output RF Spectrum
Output RF Spectrum screen
(output RF spectrum measurement screen)
<F12>Power Meter
Power Meter screen
(power measurement screen)
The Next Menu key [▲] can be used to scroll the screen vertically.
<F7>Setup TX Parameter
Setup TX Parameter screen
(TX measurement condition setup screen)
<F9>Select All Measure Item
Select All Measure Items screen
(TX all-measured value item setting screen)
<F2>RX Measure
RX Measure
<F7>Bit Error Rate
Bit Error Rate screen
(TX bit error rate [BER] measurement screen)
The Next Menu key [▲] can be used to scroll the screen vertically.
<F9>Setup RX Parameter
Setup RX Parameters screen
(RX measurement condition setup screen)
<F3>Call Proc
Call Proc
<F7>Sequence Monitor
Sequence Monitor screen
(Call processing sequence monitor screen)
The Next Menu key [▲] can be used to scroll the screen vertically.
<F9>Setup Call Proc Parameter
Setup Call Proc Parameter screen
(Call processing condition setting screen)

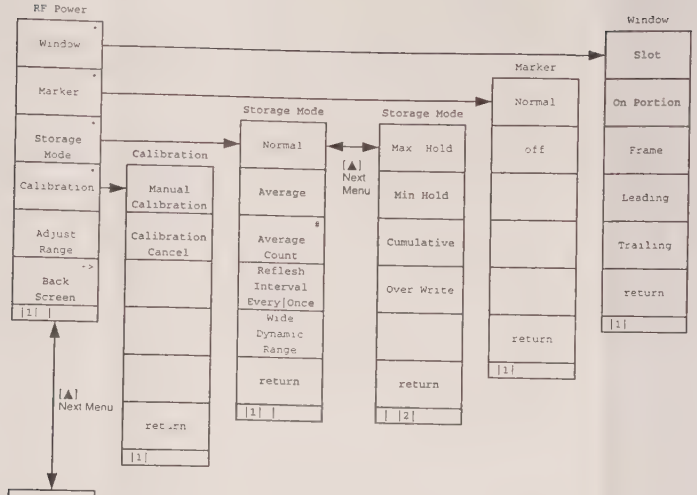
[Function key transitions on various screens]

Note: If [F12], [Back Screen], or [return] displayed at the bottom of the function key is selected, the screen returns to the upper hierarchy.




Modulation Analysis Screen
Mod Anal.
Waveform Display
Storage Mode
Calibration
Adjust Range
Back Screen
Manual Calibration
Calibration Cancel
return
Normal
Average
Average Count
Refresh Interval
Every Time
return
Modulation Analysis Screen
(Phase Error, Magnitude Error)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Manual Calibration
Calibration Cancel
return
Normal
Over Write
return
Normal
off
return
Trace format
Constel-lation
Eye Diagram
Phase Error
Magnitude Error
return
(▲) Next Menu
Vertical Scale
V-Scale
5%
10%
25%
50%
100%
return
For Phase Error, Unit is "deg."
Waveform Display Screen
(Constellation)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Manual Calibration
Calibration Cancel
return
Normal
Over Write
return
Normal
Off
return
Trace format
Constel-lation
Eye Diagram
Phase Error
Magnitude Error
return
(▲) Next Menu
Inter-polation
Non
Linear
10 Points
return
Waveform Display Screen
(Eye Diagram)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Manual Calibration
Calibration Cancel
return
Normal
Over Write
return
Normal
off
return
Trace format
Constel-lation
Eye Diagram
Phase Error
Magnitude Error
return

RF Power screen

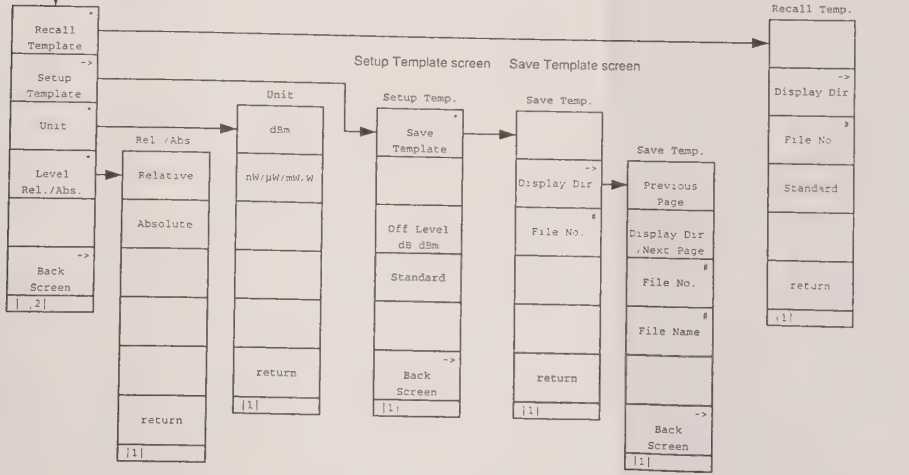



Power Meter screen

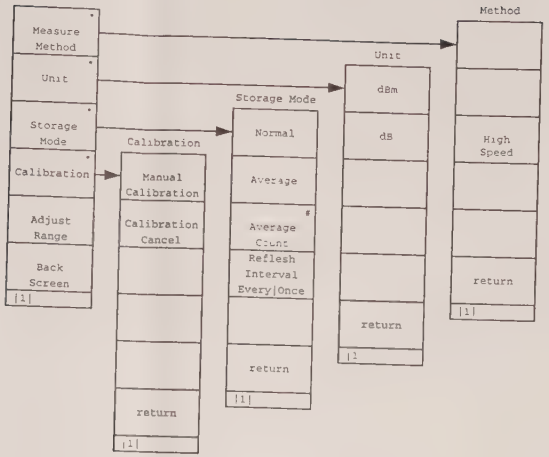
Recall Template screen

Setup Template screen

Save Template screen

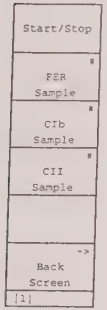


Output RF Spectrum screen



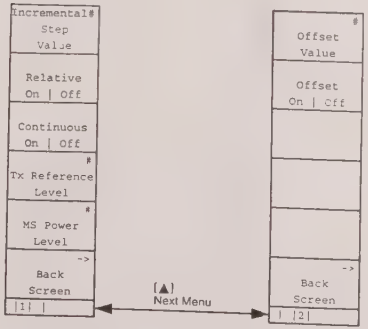

Bit Error Rate screen

When <F1> Measure is selected

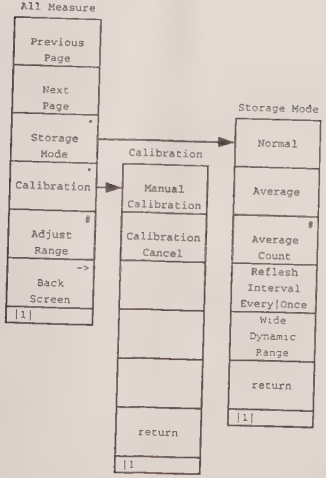



When <F2> Frequency is selected

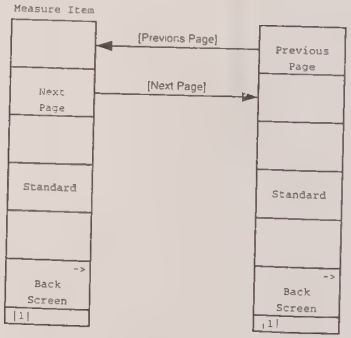
When <F3> Level is selected

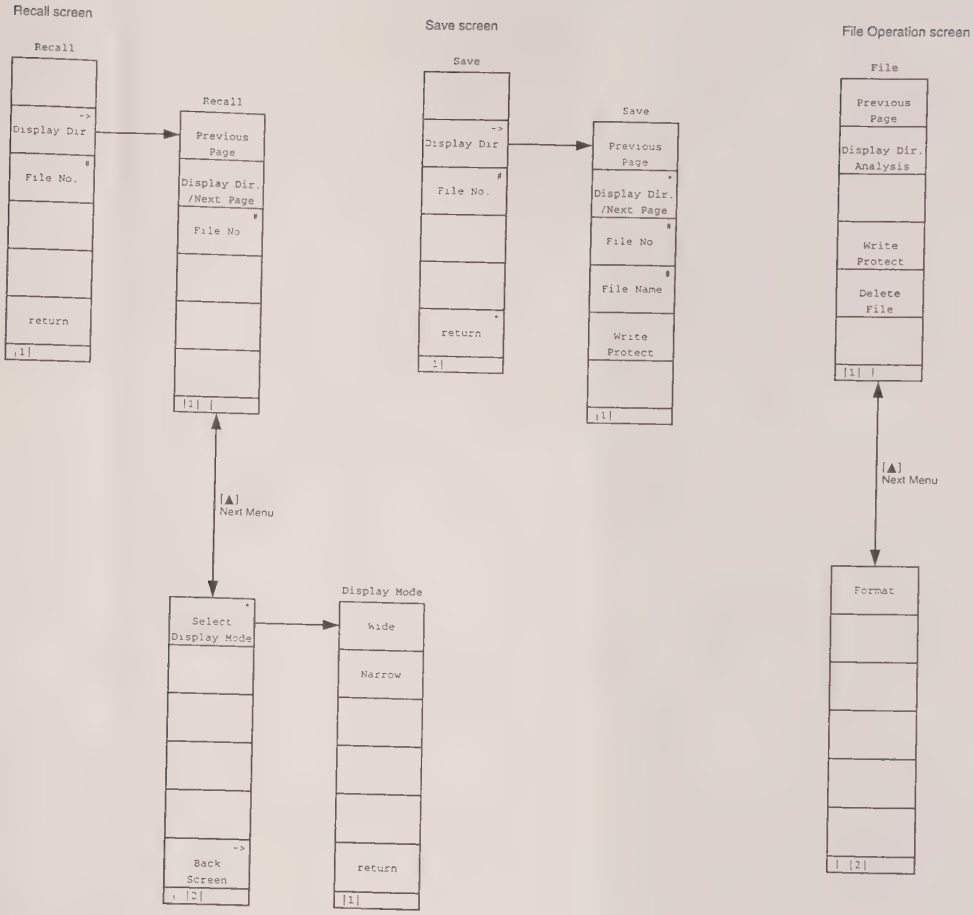



TX All Measure screen

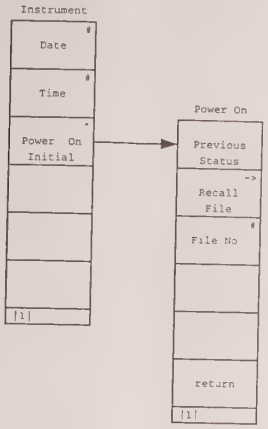



Select All Measure Item screen

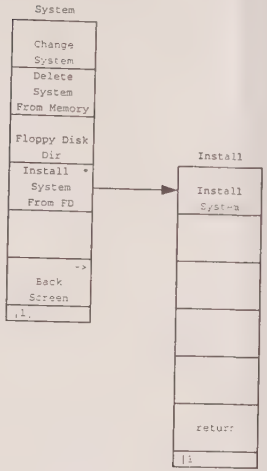



Recall screen
Recall
Display Dir
File No.
return
Recall
Previous Page
Display Dir. /Next Page
File No
[▲] Next Menu
Select Display Mode
Back Screen
Display Mode
Wide
Narrow
return
Save screen
Save
Display Dir
File No.
return
Save
Previous Page
Display Dir. /Next Page
File No
File Name
Write Protect
File Operation screen
File
Previous Page
Display Dir. Analysis
Write Protect
Delete File
[▲] Next Menu
Format

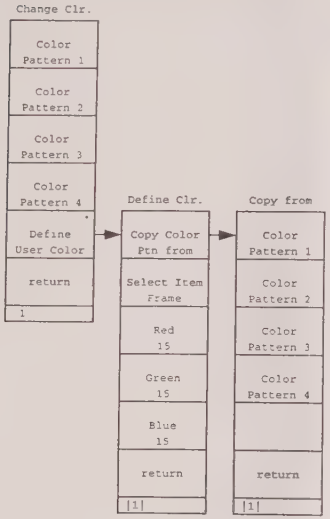
Instrument Setup screen




Change System screen




Change Color menu



# MX880215A
# GSM Measurement Software
# (For MT8802A)
# Operation Manual
# (Remote Control)

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# SECTION 1
# GENERAL

This section outlines the Remote Control functions of the MT8802A Radio Communication Analyzer.

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## 1.1 General Description

The MT8802A Radio Communication Analyzer, when combined with an external controller, can automate your measurement system. For this purpose, the MT8802A is equipped with an RS-232C interface port and a GPIB interface bus (IEEE Std 488.2-1987) as a standard feature.

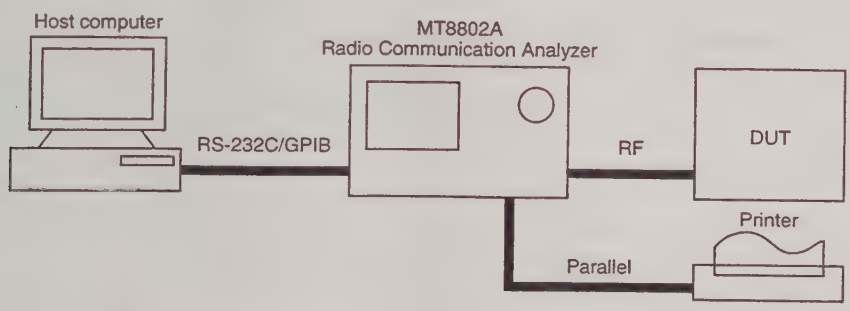
## 1.2 Remote Control Functions

The Remote Control functions of the MT8802A are as follows:

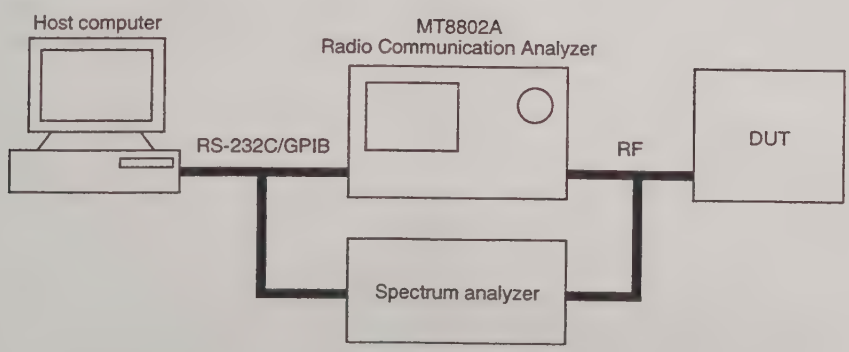
(1) Controls all functions except the power switch, floppy disk unloading , and some keys including the [Local] key
(2) Reads out all setting conditions
(3) Sets the RS-232C interface conditions and GPIB address from the panel
(4) Executes interrupts and serial polling
These functions enable to configure the automatic measurement system when the MT8802A is combined with a personal computer and other measuring instruments

## 1.3 Example of System Configuration Using RS-232C/GPIB

### (1) Control by the host computer (1)




### (2) Control by the host computer (2)



## 1.4 RS-232C Specifcations

The RS-232C specifications of the MT8802A are shown in the table below.

| Item | Specification |
|---|---|
| Function | Control from an external controller (except power switch) |
| Communication system | Asynchronous (start-stop method), half-duplex |
| Communication control | X-ON/OFF control |
| Baud rate | 1200, 2400, 4800, 9600 bps |
| Data bits | 7 bits, 8 bits |
| Parity | Odd, Even, None |
| Start bit | 1 bit |
| Stop bit | 1 bit, 2 bits |
| Connector | D-sub 9 pins, female |

## 1.5 GPIB Specifications

The GPIB of the MT8802A provides the IEEE488.1 interface function subsets listed in the table below.

GPIB Interface Functions

| Code | Interface function |
|---|---|
| SH1 | All source handshake functions are provided.<br>Synchronizes the timing of data transmission. |
| AH1 | All acceptor handshake functions are provided.<br>Synchronizes the timing for receiving data. |
| T6 | Synchronizes the timing for receiving data.<br>The serial poll function is provided.<br>The talk-only function is not provided.<br>The talker can be canceled by MLA. |
| L4 | Basic listener functions are provided.<br>The listen-only function is not provided.<br>The listener can be canceled by MTA. |
| SR1 | All service request and status byte functions are provided. |
| RL1 | All remote/local functions are provided.<br>The local lockout function is provided. |
| PP0 | Parallel poll functions are not provided. |
| DC1 | All device clear functions are provided. |
| DT1 | The device trigger function is provided. |
| C0 | Controller functions are not provided. |

# SECTION 2
# DEVICE MESSAGES

This section outlines and lists the device messages of the MT8802A.

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## 2.1 General Description

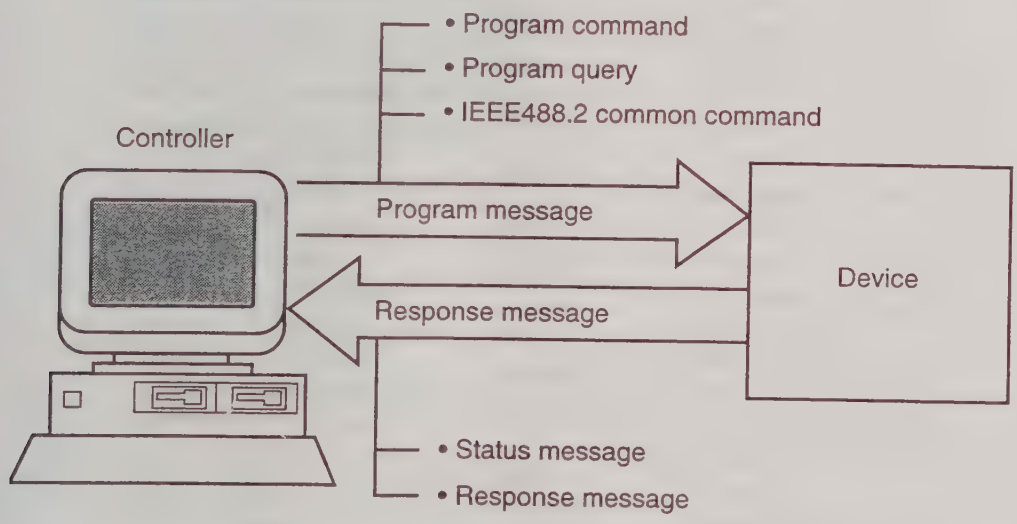
A device message is a data message transmitted between the controller and device via the system interface. Device messages are classified into program messages and response messages.

A program message is an ASCII data message transferred from the controller to the device. Program messages are classified into program commands and program queries.

Program commands are classified into device-specific commands used exclusively to control the MT8802A, and IEEE488.2 common commands. IEEE488.2 common commands are also used for other measuring instruments conforming to IEEE488.2 connected to the bus.

A program query is a command used to obtain a response message from the device. It is transferred from the controller to the device in advance, then the controller receives the response message from the device.

A response message is an ASCII data message transferred from the device to the controller.




Program messages and response messages may have a suffix (units) at the end of the numeric data.

## 2.2 Suffix Code

The table below shows the suffixes used for the MT8802A.

MT8802A Suffix Codes

| Type | Unit | Suffix code |
|---|---|---|
| Frequency | GHz | GHZ, GZ |
| | MHz | MHZ, MZ |
| | kHz | KHZ, KZ |
| | Hz | HZ |
| | Default | HZ |
| Time | second | S |
| | m second | MS |
| | μsecond | US |
| | Default | MS |
| Level (dB) | dB | DB |
| | dBm | DBM, DM |
| | dBμ | DBU |
| | Default | Determined in conformance with the set scale unit |
| Level (W) | W | W |
| | mW | MW |
| | μW | UW |
| | nW | NW |
| | Default | UW |

## 2.3 IEEE488.2 Common Commands and Supported Commands

The table below lists 39 common commands specified in the IEEE488.2 standard. IEEE488.2 common commands which are supported by the MT8802A are indicated with the ◎ symbol in the table.

| Mnemonic | Command name | IEEE488.2 standard | MT8802A supported commands |
|---|---|---|---|
| *ADD | Accept Address Command | Optional | |
| *CAL | Calibration Query | Optional | |
| *CLS | Clear Status Command | Mandatory | ◎ |
| *DDT | Define Device Trigger Command | Optional | |
| *DDT? | Define Device Trigger Query | Optional | |
| *DLF | Disable Listenner Function Command | Optional | |
| *DMC | Define Macro Command | Optional | |
| *EMC | Enable Macro Command | Optional | |
| *EMC? | Enable Macro Query | Optional | |
| *ESE | Standard Event Status Enable Command | Mandatory | ◎ |
| *ESE? | Standard Event Status Enable Query | Mandatory | ◎ |
| *ESR? | Standard Event Status Register Query | Mandatory | ◎ |
| *GMC? | Get Macor contents Query | Optional | |
| *IDN? | Identification Query | Mandatory | ◎ |
| *IST? | Individual Status Query | Optional | |
| *LMC? | Learn Macro Query | Optional | |
| *LRN? | Learn Device Setup Query | Optional | |
| *OPC | Operation Complete Command | Mandatory | ◎ |
| *OPC? | Operation Complete Query | Mandatory | ◎ |
| *OPT? | Option Identification Query | Optional | |
| *PCB | Pass Control Back Command | Mandatory if other than C0 | |
| *PMC | Purge Macro Command | Optional | |
| *PRE | Parallel Poll Register Enable Command | Optional | |
| *PRE? | Parallel Poll Register Enable Query | Optional | |
| *PSC | Power On Status Clear Command | Optional | |
| *PSC? | Power On Status Clear Query | Optional | |
| *PUD | Protected User Data Command | Optional | |
| *PUD? | Protected User Data Query | Optional | |
| *RCL | Recall Command | Optional | |
| *RDT | Resource Description Transfer Command | Optional | |
| *RDT? | Resource Description Transfer Query | Optional | |
| *RST | Reset Command | Mandatory | ◎ |
| *SAV | Save Command | Optional | |
| *SRE | Service Request Enable Command | Mandatory | ◎ |
| *SRE? | Service Request Enable Query | Mandatory | ◎ |
| *STB? | Read Status Byte Query | Mandatory | ◎ |
| *TRG | Trigger Command | Mandatory if DT1 | ◎ |
| *TST? | Self Test Query | Mandatory | ◎ |
| *WAI | Wait to Continue Command | Mandatory | ◎ |

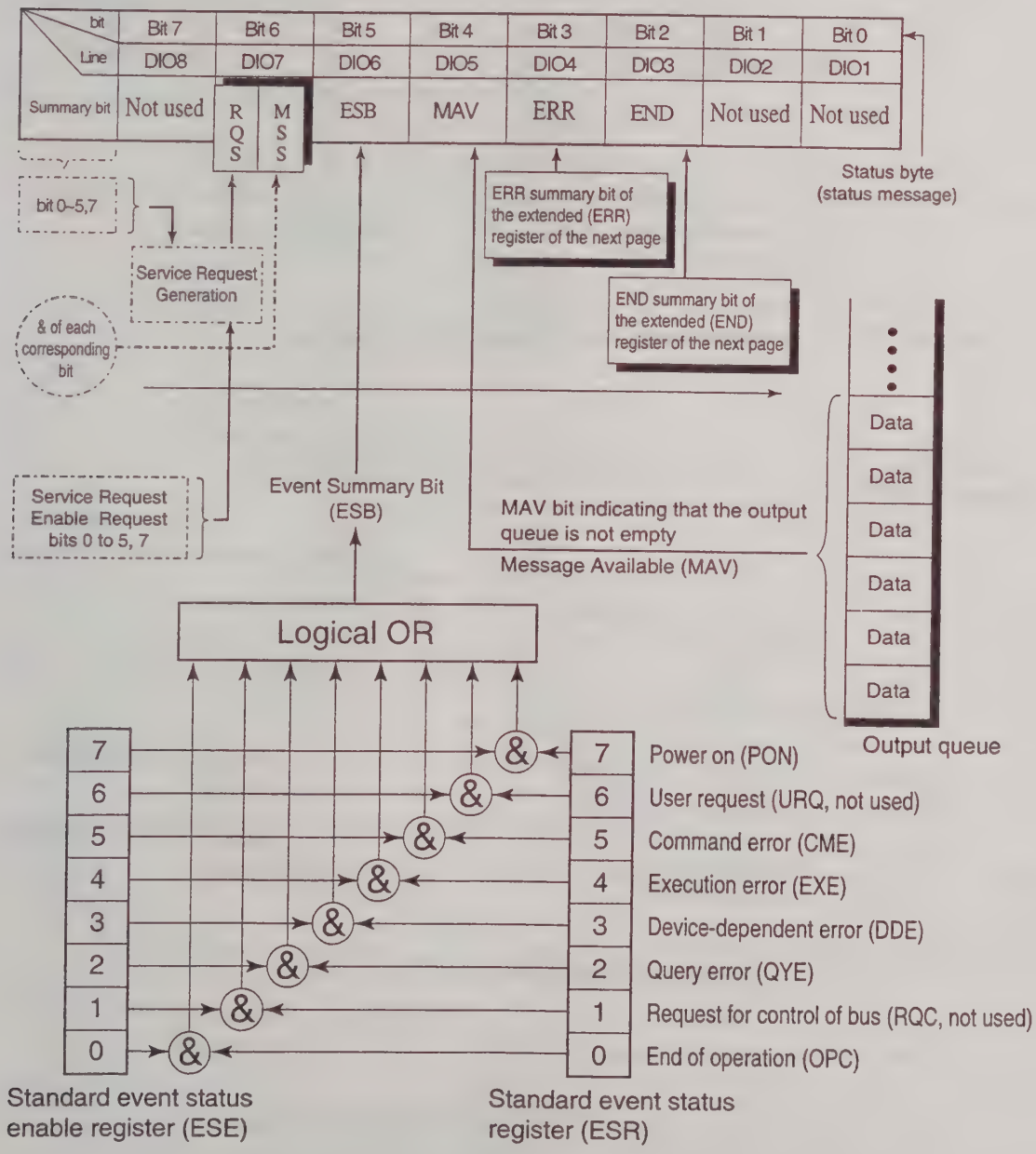
Note:The first character of IEEE488.2 common commands is always *.

Table below lists the IEEE488.2 common commands used in the MT8802A.

| IEEE488.2 common command | | | | |
|---|---|---|---|---|
| Command name | Program Msg. | Query Msg. | Response Msg. | Remarks |
| Clear status | *CLS | --- | --- | |
| Standard event status enable | *ESE n | *ESE? | n | n:0 to 255 |
| Standard event status register | --- | *ESR? | n | n:0 to 255 |
| Identification query | --- | *IDN? | id | ID:Manufacturer name, model name, etc. |
| Operation complete | *OPC | *OPC? | 1 | |
| Reset | *RST | --- | --- | |
| Service request enable | *SRE | *SRE? | n | "n:0 to 63,128 to 191" |
| Read status byte | --- | *STB? | n | |
| Trigger | *TRG | --- | --- | |
| Self test | --- | *TST? | n | |
| Wait to continue | *WAI | --- | --- | |

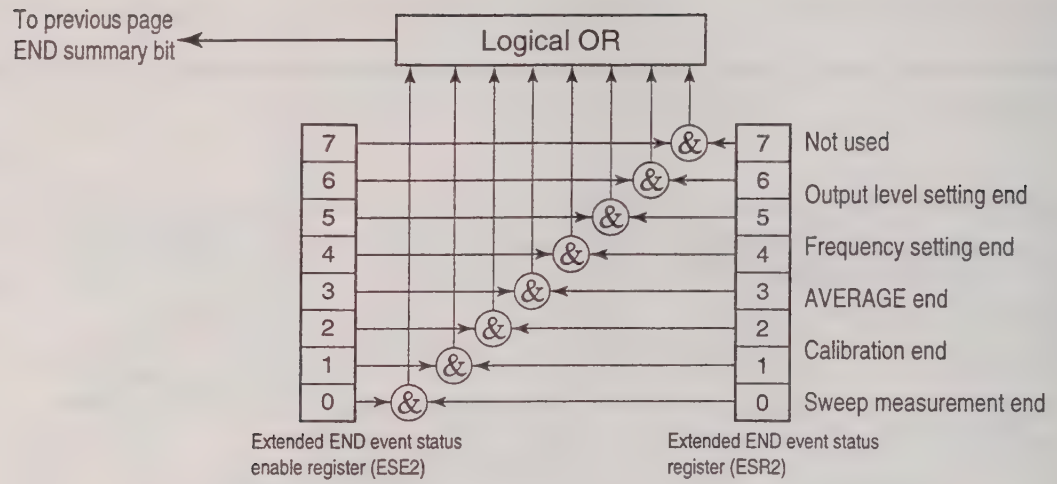
## 2.4 Status Messages

The diagram below shows the structure of service-request summary messages for the status byte register (STB) used with the MT8802A.

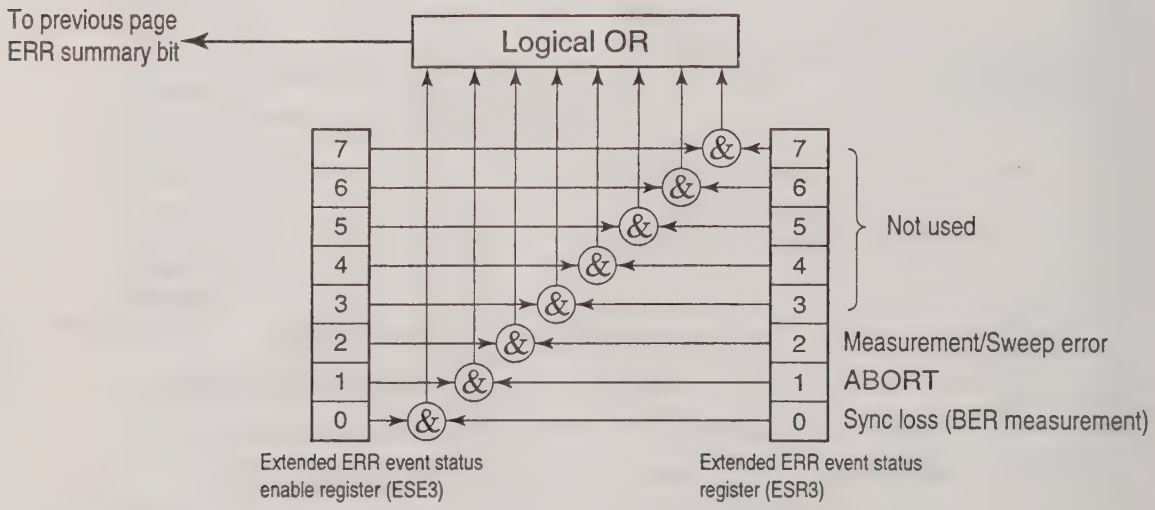



Standard Event Status (STB) Register

Note: & indicates a logical product (AND).




Extended Event Status (END) Register




Extended Event Status (ERR) Register

## 2.5 Device Message List

MT88Ø1B-specific program commands, query messages, and response messages are listed from paragraph 2.5.1.

### • Device message table

**(a)Program messages (Program Msg)/query message (Query Msg)**

(i) Uppercase characters : Reserved words

(ii) Numeric : Reserved words (numeric code)

(iii) Lowercase characters in argument

| | | |
|---|---|---|
| f (frequency) | : | Real number or integer with decimal point |
| | Units | : GHZ, MHZ, KHZ, HZ, GZ, MZ, KZ, no units = HZ |
| t(time) | : | Real number or integer with decimal point |
| | Units | : S, SC, MS, US, no unit = US |
| ℓ (level) | : | Real number or integer with decimal point |
| | Units | : DB, DBM, DM, DBU, W, MW, UW, NW, no units = set SCALE units |
| n (no units integer) | : | Integer |
| r (no units real number) | : | Real number |
| h (no units hexadecimal number) | : | Hexadecimal number |
| Others | : | Listed in remarks columns of the table |

**(b)Response messages (Response Msg)**

(i) Uppercase characters : Reserved words

(ii) Numeric : Reserved words (numeric code)

(iii) Lowercase characters in argument

| | | |
|---|---|---|
| f (frequency) | : | 12-character fixed integerunits = HZ |
| t (time) | : | Real number or integer with decimal point |
| ℓ (level) | : | Real number or integer with decimal point |
| u (ratio) | : | Real number or integer with decimal point |
| s (symbol) | : | Real number or integer with decimal point |
| n (no units integer) | : | Integer, variable number of digits (Significant digits are output.) |
| r (no units real number) | : | Real number with decimal point, variable number of digits (Significant digits are output.) |
| h (no units hexadecimal number) | : | Hexadecimal number |
| Others | : | Written in remarks columns of the table |

Notes: • Integer:NR1 format, real number:NR2 format

• Ø:Zero

Device messages are classified into 7 types according to their valid ranges:

| | | |
|---|---|---|
| 1.MT88Ø1B common commands | : | Valid in all MT88Ø1B modes |
| 2.Instrument Setup command | : | Valid in Instrument Setup panel mode |
| 3.TX/RX tester commands | : | Valid in TX/RX tester and call prosessing panel modes (on all TX/RX test and call prosessing screens) |
| 4.Setup command parameter command | : | Valid on the Setup common parameter screen |
| 5.TX tester commands | : | Valid in a range defined on each TX test screen |
| 6.RX tester commands | : | Valid in a range defined on each RX test screen |
| 7.Call processing commands | : | Valid in a range defined on each call processing screen |

These device messages are listed below.

## • Relationship between screen hierarchies and commands

[MT88Ø1B common commands]: Valid in all MT88Ø1B modes regardless of screen hierarchies

Save/Recall command
FD command (Verify)
Copy command
Single/Continuous switching command
Preset command
Waveform memory read command
Switch to upper screen command (BS: Back Screen)
Extended event status command (END)

[Screen hierarchies and commands]

Panel mode switching commands

- Instrument Setup mode:
  Instrument Setup screen:Instrument Setup command
- TX/RX tester mode:
  Setup common parameter screen:Setup common parameter command

TX/RX tester command

- TX measurement screen switching command

| *** TX test screens *** | | *** TX tester commands *** |
|---|---|---|
| Setup TX meas parameter screen | : | Setup TX meas parameter command |
| Modulation Analysis screen | : | Modulation Analysis command |
| Waveform Display screen | : | Waveform Display command |
| RF Power screen | : | RF Power command |
| Setup template screen | : | Setup template command |
| Output RF spectrum screen | : | Output RF spectrum command |
| Power meter screen | : | Power meter command |
| Select TX all measure item screen | : | Select TX all measure item command |
| TX all measure screen | : | TX all measure command |

- RX measurement screen switching commands

| *** TX test screens *** | | *** RX tester commands *** |
|---|---|---|
| Setup RX meas parameter screen | : | Setup RX meas parameter command |
| BER measure screen | : | BER measure command |

- Call processing screen switching commands

| *** Call processing screens *** | | *** Call processing commands *** |
|---|---|---|
| Setup Call processing parameter screen | : | Setup Call processing parameter commands |
| Sequence monitor screen | : | Sequence monitor commands |

## 2.5.1 MT8802A common commands

MT8802A common commands are valid in all MT8802A modes.

### (1) Save/Recall commands (parameter saving and calling)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Recall | Recall file | File No. | RCM n | --- | --- | n:Ø to 99 |
| | Recalled data | Parameter | RDATA ρ | RDATA? | ρ | ρ:Ø to 99 |
| Save | Save file | File No. | SVM n | --- | --- | n:Ø to 99 |

### (2) FD command (verify)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Verify | On | VERIFY ON | VERIFY? | ON | * |
| | | Off | VERIFY OFF | VERIFY? | OFF | |

*: Sets the Verify operation to be performed or not at accessing FD.

### (3) Copy command (copy, printer type)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Copy | | PRINT | --- | --- | |
| | | | PLS Ø | --- | --- | |
| | Printer type | ESC/P(24DOT) | PMOD 6 | PMOD? | 6 | |
| | | HP | PMOD 3 | PMOD? | 3 | |

### (4) Single/Continuous switching command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Single | Measurement/ | SNGLS | --- | --- | |
| | | sweep start | S2 | --- | --- | |
| | | Measurement/ | SWP | --- | --- | |
| | | sweep synchronization | TS | --- | --- | |
| | Continuous | | CONTS | --- | --- | |
| | | | S1 | --- | --- | |
| | Measurement/ | Measurement/sweep end | --- | SWP? | SWP Ø | |
| | sweep status | During measurement/sweep | --- | SWP? | SWP 1 | |

### (5) Preset command (initialization, power-on setting)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Preset | | PRE | --- | --- | |
| | | | INI | --- | --- | |
| | | | IP | --- | --- | |
| | Preset value | Initialization | POWERON IP | --- | --- | |
| | | Setting at power failure (Previous state) | POWERON LAST | --- | --- | |
| | | Recall memory No. | POWERON n | --- | --- | n:Ø to 99 |

(6) Waveform memory read commands (XMC, XMD, XMN, XMP, XMM)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Modulation analysis | I-Q | MEM C | XMC pØ,p1,d | XMC? pØ,p1,d | b,b,b,... | pØ:I,Q selector<br>Ø:Q data, 1:I data<br>p1:Start position<br>Ø to 147Ø<br>(=Ø to 147.Ø bit)<br>d:data length<br>1 to 1471 |
| | Magnitude error | MEM N | XMN p,d | XMN? p,d | b,b,b,... | pl:Start position<br>Ø to 147Ø<br>(=Ø to 147.Ø bit)<br>d:data length<br>1 to 1471 |
| | Phase error | MEM P | XMP p,d | XMP? p,d | b,b,b,... | p:Start position<br>Ø to 147Ø<br>(=Ø to 147.Ø bit)<br>d:data length<br>1 to 1471 |
| RF power | RF power | MEM D | XMD p,d | XMD? p,d | b,b,b,... | pl:Start position<br>Ø to 145ØØ<br>(=Ø to 147.Ø bit)<br>(=-1ØØ.Ø to 135Ø.Ø bit)<br>d:data length<br>1 to 145Ø1 |
| Output format | Output format | ASCII | BIN Ø | --- | --- | |
| | | | BIN OFF | --- | --- | |
| | | BINARY | BIN 1 | --- | --- | |
| | | | BIN ON | --- | --- | |
| Demodulation | Demodulation | Mem M | XMM p, b | XMM? p,b | b,b,b,... | |

(7) Panel mode switching command (TX/RX tester mode, Instrument Setup mode)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | TX/RX tester | | PNLMD TESTER | PNLMD? | TESTER | |
| | Instrument setup | | PNLMD SYSTEM | PNLMD? | SYSTEM | |

(8) Switch to upper screen command (BS)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Back screen | | BS | --- | --- | |

(9) Extended event status command (END)

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Event status | END event status | Event status enable | ESE2 n | ESE2? | n | n:Ø to 255 |
| | | Event status register | --- | ESR2? | n | |
| | | Event status enable | ESE3 n | ESE3? | n | n:Ø to 255 |
| | | Event status register | --- | ESR3? | n | |

(10) Screen off command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Screen off | Off | SCREEN OFF | --- | --- | |
| | | Reset (Screen ON) | *RST | --- | --- | |

(11) MT8801 Serial Number read-out command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Serial number | --- | --- | SERIAL? | MTXXXXX | ex. MT22459 |

(12) Software version read-out command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | Software version | --- | --- | VERSION? | rØ,r1 | rØ: Main version<br>r1: System version<br>ex: 1,ØØ,1.Ø5 |

## 2.5.2 Instrument Setup command

The Instrument Setup command is valid in Instrument Panel mode.

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Hardware | Reference frequency | 1ØMHz | REF 1ØMHZ | REF? | 1ØMHZ | |
| | | 13MHz | REF 13MHZ | REF? | 13MHZ | |
| | RF Input/Output | Main | RFINOUT MAIN | RFINOUT? | MAIN | |
| | | AUX | RFINOUT AUX | RFINOUT? | AUX | |
| | | Main-in Aux-out | RFINOUT MAINAUX | RFINOUT? | MAINAUX | MT8801C only |
| | | Main-out Aux-in | RFINOUT AUXMAIN | RFINOUT? | AUXMAIN | MT8801C only |
| Display | Display | On | DISPL ON | --- | --- | |
| | | Off | DISPL OFF | --- | --- | |
| | Title display | DATE/TIME | TTL DATE | TTL? | DATE | |
| | | USER define | TTL USER | TTL? | USER | |
| | | OFF | TTL OFF | TTL? | OFF | |
| | Title input | User title | TITLE a | TITLE? | a | 32 character MAX |
| | | | KSE a | --- | --- | |
| | Select date display mode | Japan (yy-mm-dd) | DATEMODE YMD | DATEMODE? | YMD | |
| | | USA (mm-dd-yy) | DATEMODE MDY | DATEMODE? | MDY | |
| | | Europe (dd-mm-yy) | DATEMODE DMY | DATEMODE? | DMY | |
| | Set and read date | Japan (yy-mm-dd) | DATE yy,mm,dd | DATE? | yy,mm,dd | |
| | Set and read time | | TIME hh,mm,ss | TIME? | hh,mm,ss | |
| Buzzer | Buzzer switch | On | ALARM ON | ALARM? | ON | |
| | | | BEP 1 | --- | --- | |
| | | | BEP ON | --- | --- | |
| | | Off | ALARM OFF | ALARM? | OFF | |
| | | | BEP Ø | --- | --- | |
| | | | BEP OFF | --- | --- | |
| | Sounds buzzer | | BZR | --- | --- | |
| GPIB | Terminater | LF | TRM Ø | --- | --- | |
| | | CR/LF | TRM 1 | --- | --- | |
| RS232C | Baud rate | 96ØØ | BAUD 96ØØ | BAUD? | 96ØØ | |
| | | 48ØØ | BAUD 48ØØ | BAUD? | 48ØØ | |
| | | 24ØØ | BAUD 24ØØ | BAUD? | 24ØØ | |
| | | 12ØØ | BAUD 12ØØ | BAUD? | 12ØØ | |
| | Parity | Even | PRTY EVEN | PRTY? | EVEN | |
| | | Odd | PRTY ODD | PRTY? | ODD | |
| | | Off | PRTY OFF | PRTY? | OFF | |
| | Data bit | 7bits | DTAB 7 | DTAB? | 7 | |
| | | 8bits | DTAB 8 | DTAB? | 8 | |
| | Stop bit | 1bit | STPB 1 | STPB? | 1 | |
| | | 2bits | STPB 2 | STPB? | 2 | |
| | Time out | | TOUT t | TOUT? | t | |
| | Delimiter | LF | DELM Ø | --- | --- | |
| | | CR/LF | DELM 1 | --- | --- | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| color | Select color | | COLORPTN COLOR1<br>COLORPTN COLOR2<br>COLORPTN COLOR3<br>COLORPTN COLOR4<br>COLORPTN USERCOLOR | | | |
| | Copy from | | COPYCOLOR COLOR1<br>COPYCOLOR COLOR2<br>COPYCOLOR COLOR3<br>COPYCOLOR COLOR4 | ---<br>---<br>---<br>--- | ---<br>---<br>---<br>--- | |
| | User define | Red, green, blue | COLORDEF n,r,g,b | COLORDEF? n | r,g,b | n=Frame Number<br>Ø to 16<br>r,g,b= Ø to 7 |

## 2.5.3 TX/RX tester command

- The TX/RX tester commands are valid in TX/RX tester and Call processing panel mode (on all RX/TX test screens).
- Query messages of the Setup common parameter command are also valid on the Setup common parameter screen and lower screens (all TX/RX test and Call processing screens). (See paragraph 2.5.4.)

(1) System mode switching command (GSM)

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| GSM | | SYS GSM | SYS? | GSM | |

(2) TX measurement screen switching command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| Setup common parameter | | MEAS SETCOM | MEAS? | SETCOM | |
| Setup TX meas parameter | | MEAS SETTX | MEAS? | SETTX | |
| Select TX all measure item | | MEAS TXITEM | MEAS? | TXITEM | |
| TX all measure | | MEAS TXALL | MEAS? | TXALL | |
| Modulation analysis | | MEAS MODANAL | MEAS? | MODANAL | |
| Waveform display | | MEAS WAVEFORM | MEAS? | WAVEFORM | |
| RF power | | MEAS RFPWR | MEAS? | RFPWR | |
| Output RF spectrum | | MEAS ADJ,HIGH | MEAS? | ADJ,HIGH | |
| Power meter | | MEAS PWRMTR | MEAS? | PWRMTR | |

(3) RX measurement screen switching command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| Setup common parameter | | MEAS SETCOM | MEAS? | SETCOM | |
| Setup RX meas parameter | | MEAS SETRX | MEAS? | SETRX | |
| Bit error rate | | MEAS BER | MEAS? | BER | |

(4) Call processing switching command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| Setup common parameter | | MEAS SETCOM | MEAS? | SETCOM | |
| Setup Call processing parameter | | MEAS SETSIG | MEAS? | SETSIG | |
| Sequence monitor | | MEAS SEQMON | MEAS? | SEQMON | |

(5) Measure result status command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| Measure result status | | --- | MSTAT? | n | |

• Response value n of MSTAT?

The table below lists the meanings of response values of MSTAT? (measurement result status command).

| Value of n | Explanation |
|---|---|
| 0 | Normal termination |
| 1 | RF input limit |
| 2 | Level over |
| 3 | Level under |
| 4 | Unmeasurable |
| 5 | Synchronous word undetectable |
| 6 | Synchronization being established (BER Measure) |
| 7 | Synchronization loss (BER Measure) |
| 8 | Overflow (BER Measure) |
| 9 | Unmeasured |
| 12 | Time out (TX Measure) |

(6) RF input/output connector switching command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| RF Input/Output | Main | RFINOUT MAIN | RFINOUT? | MAIN | |
| | Aux | RFINOUT AUX | RFINOUT? | AUX | |
| | Main-in Aux-out | RFINOUT MAINAUX | RFINOUT? | MAINAUX | MT8801C only |
| | Main-out Aux-in | RFINOUT AUXMAIN | RFINOUT? | AUXMAIN | MT8801C only |

(7) 10 MHz/13 MHz Reference Input checking command

| Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|
| Reference Input | | --- | EXTREF? | a | a: VALID, INVALID |

(8) 5 Band User Calibration

| Intermediate | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| 5 Band User Calibration | TX calibration | TX calibration band definition | DEFTXBAND n, fØ, f1 | DEFTXBAND? n | fØ, f1 | *1<br>n: 1 to 50 (Band)<br>fØ: Beginning Freq. [Hz]<br>f1: Ending Freq. [Hz]<br><br>Initial Setting<br>n: 1<br>Band1<br>fØ=3ØØØØØ<br>f1=599999999<br>Band2<br>fØ=6ØØØØØØØØ<br>f1=1199999999<br>Band3<br>fØ=12ØØØØØØØØ<br>f1=1799999999<br>Band4<br>fØ=18ØØØØØØØØ<br>f1=2399999999<br>Band5<br>fØ=24ØØØØØØØØ<br>f1=3ØØØØØØØØ |
| | | TX user calibration | TXUSRCAL n, ℓ | TXUSRCAL? n | ℓ | n: 1 to 5 (Band)<br>ℓ: Calibration value<br>-50.0 to 50.0 [dB]<br>Initial Setting<br>n: 1<br>ℓ: 0.0 |
| | | Drift compensation | CMPTXPWR | CMPTXPWR? | ℓ | |
| | RX calibration | RX calibration band definition | DEFRXBAND n, fØ, f1 | DEFRXBAND? n | fØ, f1 | *1<br>n: 1 to 5 (Band)<br>fØ: Beginning Freq. [Hz]<br>f1: Ending Freq. [Hz] |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | IInitial Setting<br>n: 1<br>Band1<br>f0=300000<br>f1=599999999<br>Band2<br>f0=600000000<br>f1=1199999999<br>Band3<br>f0=1200000000<br>f1=1799999999<br>Band4<br>f0=1800000000<br>f1=2399999999<br>Band5<br>f0=2400000000<br>f1=3000000000 |
| | | RX user calibration | RXUSERCAL n, ℓ | RXUSERCAL? | ℓ | n: 1 to 5 (Band)<br>ℓ : Calibration value<br>-50.0 to 50.0 [dB]<br>Initial Setting<br>n:1<br>ℓ : 0.0 |
| | Calibration mode switch | | CALMODE n | CALMODE? | n | n:<br>n=2 band user calibration<br>1=5 band user calibration<br>Initial Setting<br>0 (2 band user calibration) |

*1 If the band is overlapped,higher band i.e. the band which has higher number n is applied.

Example : DEFRXBAND 1, 1000000000, 150000000 (RX Band 1 = 1 GHz to 1.5 GHz )
DEFRXBAND 2, 1400000000, 190000000 (RX Band 2 = 1.4 GHz to 1.9 GHz )

This responses are as follows.

DEFRXBAND? 1
"100000000,139999999" (RX Band 1 = 1 GHz to 1.4 GHz – 1 Hz)
DEFRXBAND? 2
"140000000,190000000" (RX Band 2 = 1.4 GHz to 1.9 GHz)

## 2.5.4 Setup common parameter command

- Program messages of the Setup common parameter command are valid on Setup common parameter screen.
- Note that Level, Frequency, Channel and Loop Back program messages are also valid on all measurement screens of the TX/RX test and Sequence monitor screen.
- Query messages of the Setup common parameter command are valid on the Setup common parameter screen and lower screens (all TX/RX test and Call processing screens).

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| System Combination | System Combination | GSM | SYSCMB GSM | SYSCMB? | GSM | |
| | | GSM/DCS18ØØ | SYSCMB DCS18ØØ | SYSCMB? | DCS18ØØ | |
| | | GSM/PCS19ØØ | SYSCMB PCS19ØØ | SYSCMB? | PCS19ØØ | |
| DUT control | DUT control | Call processing ON | DUTCTRL CALLP | DUTCTRL? | CALLP | |
| | | | SIGNAL ON | SIGNAL? | ON | |
| | | Call processing OFF | DUTCTRL NONE | DUTCTRL? | NONE | |
| | | | SIGNAL OFF | SIGNAL? | OFF | |
| Frequency | Control Channel | | CTRLCH n | CTRLCH? | n | n:Ø to 1Ø23 (1 to 124; GSM) |
| | TCH Channel | | CHAN n | CHAN? | n | n:Ø to 1Ø23 (1 to 124; GSM) |
| | | Step up | CHAN UP | --- | --- | |
| | | Step down | CHAN DN | --- | --- | |
| | TX frequency | | TFREQ f | TFREQ? | f | f:Ø.3 to 3ØØØ[MHz]*2 |
| | RX frequency | | RFREQ f | RFREQ? | f | f:Ø.3 to 3ØØØ[MHz]*2 |
| Level | MS power level | | MSPWR n | MSPWR? | n | n=Ø to 31 |
| | TX level | | RFLVL ℓ | RFLVL? | ℓ | ℓ :5 to +42[dBm]/Main- -3Ø to +22[dBm]/Aux |
| | | Step up | RFLVL UP | --- | --- | |
| | | Step down | RFLVL DN | --- | --- | |
| | RX level | | OLVL ℓ | OLVL? | ℓ | ℓ :-143 to -28[dBm]/Main- -143 to -3[dBm]/Aux |
| Channel & Level | TCH channel & MS Power Level | | CHMSPWR nØ, n1 | CHMSPWR? | nØ, n1 | nØ: TCH channel, Ø to 1Ø23 (1 to 124; GSM) n1: MS Power Level, Ø to 31 |
| Loop Back | | Loop Back On | LOOPBACK ON | LOOPBACK? | ON | *1 |
| | | Loop Back Off | LOOPBACK OFF | LOOPBACK? | OFF | *1 |
| Signal | Measuring object | MS-NB | MEASOBJ MSNB | MEASOBJ? | MSTCH | |
| | | RACH | MEASOBJ RACH | MEASOBJ? | RACH | |
| | | CONTINUOUS | MEASOBJ CONT | MEASOBJ? | CONT | *2 |
| | CODEC type | FR | CODEC FR | CODEC? | FR | |
| | | EFR | CODEC EFR | CODEC? | EFR | |
| | | HRØ | CODEC HRØ | CODEC? | HRØ | |
| | | HR1 | CODEC HR1 | CODEC? | HR1 | |
| | TCH slot No. | | SLTNUM n | SLTNUM? | n | n:Ø to 7 (2 to 6; Call Proc) |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Signal | Training sequence | Training sequence Ø | TSPAT TSCØ | TSPAT? | TSCØ | |
| | | Training sequence 1 | TSPAT TSC1 | TSPAT? | TSC1 | |
| | | Training sequence 2 | TSPAT TSC2 | TSPAT? | TSC2 | |
| | | Training sequence 3 | TSPAT TSC3 | TSPAT? | TSC3 | |
| | | Training sequence 4 | TSPAT TSC4 | TSPAT? | TSC4 | |
| | | Training sequence 5 | TSPAT TSC5 | TSPAT? | TSC5 | |
| | | Training sequence 6 | TSPAT TSC6 | TSPAT? | TSC6 | |
| | | Training sequence 7 | TSPAT TSC7 | TSPAT? | TSC7 | |
| | Timing advance | | TMADVANCE n | TMADVACE? | n | n:Ø to 63[bit] |
| Call processing | Start call proc. | | CALLSA | ---- | ---- | |
| | Stop call proc. | | CALLSO | ---- | ---- | |
| | Paging | | CALLPG | ---- | ---- | |
| | Disconnect from NW | | CALLDISC | ---- | ---- | |
| | Call proc. status | | ---- | CALLSTAT? | Ø (Stop) | |
| | | | | | 1 (Idle) | |
| | | | | | 2 (Paging) | |
| | | | | | 3 (Radio Link) | |
| | | | | | 4 (Registration) | |
| | | | | | 5 (Organization) | |
| | | | | | 6 (Termination) | |
| | | | | | 7 (Communication) | |
| | | | | | 8 (Hand Over) | |
| | | | | | 9 (Disc from NW) | |
| | | | | | 1Ø (Disc from MS) | |
| | | | | | 11 (Radio Disc) | |
| | | | | | 2Ø (DUT CONTROL = NONE) | |

*1 Program MSG. is valid only when 'CALL STATUS' is 'Communication'.

*2 Program MSG. is valid only when 'DUT CONTROL' is 'NONE'.

## 2.5.5 TX tester command

- Program messages of the TX tester commands are valid in ranges defined on TX test screen.
- Query messages of the TX tester command are valid on all TX test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all TX test measurement screens. (See paragraph 2.5.4.)

### (1) Setup TX meas parameter command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Measurement trigger | | Training Sequence | MEASTRG TS | MEASTRG? | TS | |
| | | Video | MEASTRG VIDEO | MEASTRG? | VIDEO | |
| User cal factor | Band 1 | | TXUCALBA1 ℓ | TXUCALBA1? | ℓ | ℓ :-3Ø.ØØ to +3Ø.ØØ[dB] |
| | Band 2 | | TXUCALBA2 ℓ | TXUCALBA2? | ℓ | ℓ :-3Ø.ØØ to +3Ø.ØØ[dB] |
| Output RF Spectrum RBW and VBW Filter | | BW=3ØkHz | RBWFLT 3ØKHZ | RBWFLT? | 3ØKHZ | |
| | | BW=1ØØkHz | RBWFLT 1ØØKHZ | RBWFLT? | 1ØØKHZ | |

### (2) Modulation Analysis command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Storage mode | Normal | | STORAGE NRM | STORAGE? | NRM | |
| | Average | | STORAGE AVG | STORAGE? | AVG | |
| | Average on | | VAVG ON | ---- | ---- | |
| | | | VAVG 1 | ---- | ---- | |
| | | | KSG | ---- | ---- | |
| | Average off | | VAVG OFF | ---- | ---- | |
| | | | VAVG Ø | ---- | ---- | |
| | | | KSH | ---- | ---- | |
| | Average count | | AVR n | AVG? | n | n=2 to 9999 |
| | | | VAVG n | VAVG? | n | n=2 to 9999 |
| | Reflesh interval | | INTVAL EVERY | INTVAL? | EVERY | |
| | | | INTVAL ONCE | INTVAL? | ONCE | |
| Calibration | Calibration | | PWRCAL | PWRCAL? | ℓ | |
| | | | CALVAL ℓ | CALVAL? | f, ℓ | f=0: Not calibrated<br>f=1: Internal calibration<br>f=2: External calibration<br>ℓ : -10.00 to 10.00 |
| | Calibration cancel | | CALCANCEL | ---- | ---- | |
| | Adjust range | | ADJRNG | ---- | ---- | |
| Measure result | Carrier frequency | | ---- | CARRF? | f | |
| | Carrier frequency error | | ---- | CARRFERR? | f | |
| | | | ---- | CARRFERR? un | un:HZ,PPM | |
| | RMS phase error | | ---- | PHASEERR? | u | |
| | Peak phase error | | ---- | PPHASEERR? | u | |
| | RMS Magnitude error | | ---- | MAGTDERR? | u | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Measure result (GPIB) | +Peak phase error | | ---- | PPHASEERR? + | u | |
| | -Peak phase error | | ---- | PPHASEERR? - | u | |
| | RMS phase error Max Hold Value | | ---- | MAXPHASEERR? | u | |
| | +Peak phase error symbol | | ---- | PPHASESYM? + | s | |
| | -Peak phase error symbol | | ---- | PPHASESYM? - | s | |
| | +Peak magnitude error | | ---- | PMAGTDERR? + | u | |
| | -Peak magnitude error | | ---- | PMAGTDERR? - | u | |
| | RMS magnitude error Max Hold Value | | ---- | MAXMAGTDERR? | u | |
| | +Peak magnitude error symbol | | ---- | PMAGTDSYM? + | s | |
| | -Peak magnitude error symbol | | ---- | PMAGTDSYM? - | s | |
| Measurement result (Multi response) | | | ---- | MODANALMEAS? | rØ, r1, r2, r3, r4, r5, r6, r7, r8, r9, r1Ø, r11, r12, r13 | returns all measurement results see *1 |
| | | | ---- | MODANALMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12, n13 | rØ, r1, r2, r3, r4, r5, r6, r7, r8, r9, r1Ø, r11, r12, r13 | returns selected measurement results see *1 |

*1 Multi response

Query format example:

MODANALMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12, n13

nØ to n13:Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=14)

Actual query example:

MODANALMEAS? Ø, Ø, 1, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of Carrier freq error (ppm) and RMS Phase error

Response format:

rØ: Carrier freq
r1: Carrier freq error (Hz)
r2: Carrier freq error (ppm)
r3: RMS phase error
r4: Peak phase error
r5: RMS magnitude error
r6: +Peak phase error
r7: -Peak phase error
r8: +Peak phase error symbol
r9: -Peak phase error symbol
r1Ø: +Peak magnitude error
r11: -Peak magnitude error
r12: +Peak magnitude error symbol
r13: -Peak magnitude error symbol

Actual Response example: (Carrier freq error (ppm) and RMS Phase error)

Ø.1, 2.82

(3) Waveform display command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Trace format | Trace format | Constellation | TRFORM CONSTEL | TRFORM? | CONSTEL | |
| | | | TRFORM IQ | --- | --- | |
| | | Eye diagram | TRFORM EYE | TRFORM? | EYE | |
| | | Phase error | TRFORM PHASE | TRFORM? | PHASE | |
| | | Magnitude error | TRFORM MAGTD | TRFORM? | MAGTD | |
| Marker | Marker mode | Normal | MKR NRM | MKR? | NRM | |
| | | Off | MKR OFF | MKR? | OFF | |
| | Marker position (Symbol) | Symbol | MKRS r | MKRS? | r | r=Ø to 147.Ø[bit] |
| | | | MKN r | MKN? | r | r=Ø to 147.Ø[bit] |
| | Marker level | | ---- | MKL? | r | |
| | | I | ---- | MKL? I | r | |
| | | Q | ---- | MKL? Q | r | |
| Storage mode | Storage mode | Normal | STORAGE NRM | STORAGE? | NRM | |
| | | Over write | STORAGE OVER | STORAGE? | OVER | |
| Calibration | Adjust range | | ADJRNG | --- | --- | |
| | Calibration | | PWRCAL | PWRCAL? | ℓ | |
| | | | CALVAL ℓ | CALVAL? | f, ℓ | f=0: Not calibrated<br>f=1: Internal calibration<br>f=2: External calibration<br>ℓ : -10.00 to 10.00 |
| | Calibration cancel | | CALCANCEL | --- | --- | |
| Scale mode | Interpolation (Constellation) | Non | INTPOL NON | INTPOL? | NON | |
| | | Linear | INTPOL LIN | INTPOL? | LIN | |
| | | 1Øpoints | INTPOL POINT1Ø | INTPOL? | POINT1Ø | |
| | Vertical scale (Phase,Magnitude) | 5[deg,%] | VSCALE 5 | VSCALE? | 5 | |
| | | 1Ø[deg,%] | VSCALE 1Ø | VSCALE? | 1Ø | |
| | | 2Ø[deg,%] | VSCALE 2Ø | VSCALE? | 2Ø | |
| | | 5Ø[deg,%] | VSCALE 5Ø | VSCALE? | 5Ø | |
| | | 1ØØ[deg,%] | VSCALE 1ØØ | VSCALE? | 1ØØ | |
| Measure result | Refer to Modulation analysis | | | | | |

(4) RF power command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Window | | Slot | WINDOW SLOT | WINDOW? | SLOT | |
| | | On portion | WINDOW ONPORT | WINDOW? | ONPORT | |
| | | Frame | WINDOW FRAME | WINDOW? | FRAME | |
| | | Leading | WINDOW LEAD | WINDOW? | LEAD | |
| | | Trailing | WINDOW TRAIL | WINDOW? | TRAIL | |
| Marker | Marker mode | Normal | MKR NRM | MKR? | NRM | |
| | | Off | MKR OFF | MKR? | OFF | |
| | Marker position (Symbol) | Symbol | MKRS r | MKRS? | r | r: -27.Ø to 174.Ø;Slot, On Portion -2Ø.Ø to 1274.Ø ;Frame -13.Ø to 8.Ø ;Leading 39 to 161 ;Trailing |
| | | | MKN r | MKN? | r | ditto |
| | Marker level | | ---- | MKL? | ℓ | |
| Storage mode | Normal | | STORAGE NRM | STORAGE? | NRM | |
| | Average | | STORAGE AVG | STORAGE? | AVG | |
| | Average on | | VAVG ON | ---- | ---- | |
| | | | VAVG 1 | ---- | ---- | |
| | | | KSG | ---- | ---- | |
| | Average off | | VAVG OFF | ---- | ---- | |
| | | | VAVG Ø | ---- | ---- | |
| | | | KSH | ---- | ---- | |
| | Average count | | AVR n | AVG? | n | n: 2 to 9999 |
| | | | VAVG n | VAVG? | n | n: 2 to 9999 |
| | Max hold | | STORAGE MAX | STORAGE? | MAX | |
| | Min hold | | STORAGE MIN | STORAGE? | MIN | |
| | Cumulative | | STORAGE CUM | STORAGE? | CUM | |
| | Over write | | STORAGE OVER | STORAGE? | OVER | |
| | Wide dynamic range | | STORAGE WIDE | STORAGE? | WIDE | |
| | Reflesh interval | | INTVAL EVERY | INTVAL? | EVERY | |
| | | | INTVAL ONCE | INTVAL? | ONCE | |
| Calibration | Calibration | | PWRCAL | PWRCAL? | ℓ | |
| | | | CALVAL ℓ | CALVAL? | f, ℓ | f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : -10.00 to 10.00 |
| | Calibration cancel | | CALCANCEL | ---- | ---- | |
| | Adjust range | | ADJRNG | ---- | ---- | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Level | Unit | dBm | UNIT DBM | UNIT? | DBM | |
| | | nW/uW/mW/W | UNIT WATT | UNIT? | WATT | |
| | Level | Relative | LVLREL ON | LVLREL? | ON | |
| | | | MTEMPREL ON | MTEMPREL? | ON | |
| | | Absolute | LVLREL OFF | LVLREL? | OFF | |
| | | | MTEMPREL OFF | MTEMPREL? | OFF | |
| Recall template | | File No. | SLCTTEMP n | SLCTTEMP? | ---- | n:Ø to 99 |
| | | | RCLTEMP n | ---- | ---- | n:Ø to 99 |
| Meaure result | TX power | | ---- | TXPWR? | ℓ | |
| | | | ---- | TXPWR? un | ℓ | un:DBM,WATT |
| | Carrier off power | | ---- | OFFPWR? | ℓ | |
| | | | ---- | OFFPWR? un | ℓ | un:DBM,WATT |
| | On/Off ratio | | ---- | RATIO? | ℓ | |
| | Power Flatness | Max Power | ---- | MAXPWR? | ℓ | dB only |
| | | Min Power | ---- | MINPWR? | ℓ | dB only |
| | Power vs. time | | ---- | PTLEAD? 1 | ℓ | dB only |
| | | | ---- | PTLEAD? 2 | ℓ | |
| | | | ---- | PTLEAD? 3 | ℓ | |
| | | | ---- | PTLEAD? 4 | ℓ | |
| | | | ---- | PTLEAD? 5 | ℓ | |
| | | | ---- | PTTRAIL? 1 | ℓ | |
| | | | ---- | PTTRAIL? 2 | ℓ | |
| | | | ---- | PTTRAIL? 3 | ℓ | |
| | | | ---- | PTTRAIL? 4 | ℓ | |
| | | | | PTTRAIL? 5 | ℓ | |
| | Template PASS/FAIL (On screen) | | ---- | TEMPPASS? ON | PASS | |
| | | | ---- | TEMPPASS? ON | FAIL | |
| | Template PASS/FAIL (Off screen) | | ---- | TEMPPASS? OFF | PASS | |
| | | | ---- | TEMPPASS? OFF | FAIL | |
| Meaure result (GPIB) | Frame mean power | | ---- | FMEANPWR? | ℓ | |
| | | | ---- | FMENPWR? un | ℓ | un:DBM,WATT |
| | Slot mean power | | ---- | SMEANPWR? | ℓ | |
| | | | ---- | SMENAPWR? un | ℓ | un:DBM,WATT |
| | Slot power | | ---- | SLOTPWR? n | ℓ | n: Ø to 7, dB only |
| | Reference power for template | | ---- | TEMPRPWR? | ℓ | dB only |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Meaurement result (Multi response) | | | ---- | RFPWRMEAS? | rØ, r1, r2, r3, r4, r5, r6, r7, r8, r9, r1Ø, r11, r12, r13, r14, r15, r16, r17, r18, r19, r2Ø, r21, r22, r23, r25, r26, r27, r28, r29, r3Ø, r31 | returns all measurement results see *1 |
| | | | ---- | RFPWRMEAS? nØ, n1, n2, n3, r4, r5, r6, r7, n9, n1Ø, n11, n12, n13, n14, n15, n16, n17, n18, n19, n2Ø, n21, n22, n23, n24, n25, n26, n27, n28, n29, n3Ø, n31 | rØ, r1, r2, r3, r4, r5, r6, r7, r8, r9, r1Ø, r11, r12, r13, r14, r15, r16, r17, r18, r19, r2Ø, r21, r22, r23, r25, r26, r27, r28, r29, r3Ø, r31 | returns selected measurement results see *1 |

*1 Multi response

Query format example:

RFPWRMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12, n13, n14, n15, n16, n17, n18, n19, n2Ø, n21, n22, n23, n24, n25, n26, n27, n28, n29, n3Ø, n31

nØ to n31:Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=32)

Actual query example:

RFPWRMEAS? 1, Ø, 1, Ø, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of TX power (dBm), Carrier off power (dBm) and On/Off ratio

Response format:

rØ: TX power (dBm)

r1: TX power (Watt)

r2: Carrier off power (dBm)

r3: Carrier off power (Watt)

r4: On/Off ratio

r5: MAX power

r6: MIN power

r7: Power at -28us

r8: Power at -18us

r9: Power at -1Øus

r1Ø: Power at -5us

r11: Power at Øus

r12: Power at 542.8us

r13: Power at 547.8us

r14: Power at 552.8us
r15: Power at 56Ø.8us
r16: Power at 57Ø.8us
r17: Template pass/fail (on screen)
r18: Template pass/fail (off screen)
r19: Frame mean power (dBm)
r2Ø: Frame mean power (Watt)
r21: Slot mean power (dBm)
r22: Slot mean power (Watt)
r23: Slot power Ø
r24: Slot power 1
r25: Slot power 2
r26: Slot power 3
r27: Slot power 4
r28: Slot power 5
r29: Slot power 6
r3Ø: Slot power 7
r31: Reference power for template

Note: The values of r12 to r16 are changed as follows when the measuring Object is set ot RACH.

542.8 µs → 321.2 µs
547.8 µs → 326.2 µs
552.8 µs → 331.2 µs
560.8 µs → 339.2 µs
570.8 µs → 349.2 µs

Actual Response example: (TX power (dBm),Carrier off power (dBm) and On/Off ratio)
28.24, -43.97, 72.21

(5) Setup template command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Off level | | dBm | OFFLVL DBN | OFFLVL? | DBM | |
| | | dB | OFFLVL DB | OFFLVL? | DB | |
| Level Modify | | Level 1 | TEMPLVL 1, ℓ | TEMPLVL? 1 | ℓ | ℓ :-11ØØ to +1ØØ[dB, dBm] |
| | | Level 2 | TEMPLVL 2, ℓ | TEMPLVL? 2 | ℓ | ℓ :-11Ø.Ø to +1Ø.Ø[dB] |
| | | Level 3 | TEMPLVL 3, ℓ | TEMPLVL? 3 | ℓ | ℓ :-11Ø.Ø to +1Ø.Ø[dB] |
| | | Level 4 | TEMPLVL 4, ℓ | TEMPLVL? 4 | ℓ | ℓ :-11Ø.Ø to +1Ø.Ø[dB] |
| | | Level 5 | TEMPLVL 5, ℓ | TEMPLVL? 5 | ℓ | ℓ :-11Ø.Ø to +1Ø.Ø[dB] |
| | | Level 6 | TEMPLVL 6, ℓ | TEMPLVL? 6 | ℓ | ℓ :-11Ø.Ø to +1Ø.Ø[dB] |
| Save template | Save template | File No. | SAVETEMP n | ---- | --- | n:Ø to 99 |

(6) Output RF spectrum command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Strage mode | Normal | | STRAGE NRM | STRAGE? | NRM | |
| | Average | | STRAGE AVG | STRAGE? | AVG | |
| | Average on | | VAVG ON<br>VAVG 1<br>KSG | ----<br>----<br>---- | ----<br>----<br>---- | |
| | Average off | | VAVG OFF<br>VAVG Ø<br>KSH | ----<br>----<br>---- | ----<br>----<br>---- | |
| | Average count | | AVR n<br>VAVG n | AVG?<br>VAVG? | n<br>n | n:Ø to 9999<br>n:Ø to 9999 |
| | Reflesh interval | | INTVAL EVERY<br>INTVAL ONCE | INTVAL?<br>INTVAL? | EVERY<br>ONCE | |
| Calibration | Calibration | | PWRCAL<br>CALVAL ℓ | PWRCAL?<br>CALVAL? | ℓ<br>f, ℓ | f=0: Not calibrated<br>f=1: Internal calibration<br>f=2: External calibration<br>ℓ : -10.00 to 10.00 |
| | Calibration cancel | | CALCANCEL | ---- | ---- | |
| | Adjust range | | ADJRNG | ---- | ---- | |
| Measure result | due to modulation | | ----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>----<br>---- | MODPWR? LOWØ<br>MODPWR? LOW1ØØ<br>MODPWR? LOW2ØØ<br>MODPWR? LOW25Ø<br>MODPWR? LOW4ØØ<br>MODPWR? LOW6ØØ<br>MODPWR? LOW8ØØ<br>MODPWR? LOW1ØØØ<br>MODPWR? LOW12ØØ<br>MODPWR? LOW14ØØ<br>MODPWR? LOW16ØØ<br>MODPWR? LOW18ØØ<br>MODPWR? LOW 2ØØØ<br>MODPWR? UPØ<br>MODPWR? UP1ØØ<br>MODPWR? UP2ØØ<br>MODPWR? UP25Ø<br>MODPWR? UP4ØØ<br>MODPWR? UP6ØØ<br>MODPWR? UP8ØØ<br>MODPWR? UP1ØØØ<br>MODPWR? UP12ØØ<br>MODPWR? UP14ØØ<br>MODPWR? UP16ØØ<br>MODPWR? UP18ØØ<br>MODPWR? UP2ØØØ | ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ<br>ℓ | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Measure result | due to switching transient | | ---- | SWPWR? LOWØ | ℓ | |
| | | | ---- | SWPWR? LOW1ØØ | ℓ | |
| | | | ---- | SWPWR? LOW2ØØ | ℓ | |
| | | | ---- | SWPWR? LOW25Ø | ℓ | |
| | | | ---- | SWPWR? LOW4ØØ | ℓ | |
| | | | ---- | SWPWR? LOW6ØØ | ℓ | |
| | | | ---- | SWPWR? LOW8ØØ | ℓ | |
| | | | ---- | SWPWR? LOW1ØØØ | ℓ | |
| | | | ---- | SWPWR? LOW12ØØ | ℓ | |
| | | | ---- | SWPWR? LOW14ØØ | ℓ | |
| | | | ---- | SWPWR? LOW16ØØ | ℓ | |
| | | | ---- | SWPWR? LOW18ØØ | ℓ | |
| | | | ---- | SWPWR? LOW 2ØØØ | ℓ | |
| | | | ---- | SWPWR? UPØ | ℓ | |
| | | | ---- | SWPWR? UP1ØØ | ℓ | |
| | | | ---- | SWPWR? UP2ØØ | ℓ | |
| | | | ---- | SWPWR? UP25Ø | ℓ | |
| | | | ---- | SWPWR? UP4ØØ | ℓ | |
| | | | ---- | SWPWR? UP6ØØ | ℓ | |
| | | | ---- | SWPWR? UP8ØØ | ℓ | |
| | | | ---- | SWPWR? UP1ØØØ | ℓ | |
| | | | ---- | SWPWR? UP12ØØ | ℓ | |
| | | | ---- | SWPWR? UP14ØØ | ℓ | |
| | | | ---- | SWPWR? UP16ØØ | ℓ | |
| | | | ---- | SWPWR? UP18ØØ | ℓ | |
| | | | ---- | SWPWR? UP2ØØØ | ℓ | |
| | | | ---- | SWPWR? ps,un | ℓ | ps:LOWØ to LOW2ØØØ, UPØ to UP2ØØØ un:DBM,DB |
| Measurement result (Multi response) | | | ---- | RFSPECMEAS? | rmuØ, rmlØ, rmu1, rml1, : : rsuØ, rslØ, rsu1, rsl1, : : | returns all measurement results see *1 |
| | | | ---- | RFSPECMEAS? mnØ, mn1, mn2, mn3, mr4, mn5, mn6, mn7, mn8, mn9, mn1Ø, mn11, mn12, snØ, sn1, sn2, sn3, sn4, sn5, sn6, sn7, sn8, sn9, sn1Ø, sn11, sn12 | rmuØ, rmlØ, rmu1, rml1, : : rsuØ, rslØ, rsu1, rsl1, : : | returns selected measurement results see *1 |

*1 Multi response

Query format example:

RFSPECMEAS? mnØ, mn1, mn2, mn3, mn4, mn5, mn6, mn7, mn8, mn9, mn1Ø, mn11, mn12,
snØ, sn1, sn2, sn3, sn4, sn5, sn6, sn7, sn8, sn9, sn1Ø, sn11, sn12

mnØ to mn12, snØ to sn12 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=26)

Actual query example:

RFSPECMEAS? Ø, 1, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, 1, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of 1ØØ kHz and 2ØØ kHz

Response format:

rmuØ, rmlØ, rmu1, rml1, ....., rsuØ, rslØ, rsu1, rsl1, .....

rmu: Modulation upper

rml: Modulation lower

rsu: Switching upper

rsl: Switching lower

Actual Response example: (1ØØ kHz and 2ØØ kHz)

-5.47, -7.42, -35.38, -33.64, 16.96, 16.5Ø, -7.9Ø, -5.92

(7) Power meter command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Range | Range up | | RNG UP | ---- | ---- | |
| | Range down | | RNG DN | ---- | ---- | |
| | Hold (Ø.1mW) | | RNG2 | ---- | ---- | |
| | Hold (1mW) | | RNG3 | ---- | ---- | |
| | Hold (1ØmW) | | RNG4 | ---- | ---- | |
| | Hold (1ØØmW) | | RNG5 | ---- | ---- | |
| | Adjust range | | ADJRNG | ---- | ---- | |
| Calibration | Zero set | | ZEROSET | ---- | ---- | |
| | | | ZAJ | ---- | ---- | |
| Measure result | Power | | ---- | POWER? un | ℓ | un:DBM,WATT,DB |

(8) Select TX all measure item command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Frequency | Frequency | On | MCARRF ON | MCARRF? | ON | |
| | | Off | MCARRF OFF | MCARRF? | OFF | |
| | Frequency error measurement | On | MCARRFERR ON | MCARRFERR? | ON | |
| | | Off | MCARRFERR OFF | MCARRFERR? | OFF | |
| | Frequency error unit | kHz | UCARRFERR KHZ | UCARRFERR? | KHZ | |
| | | ppm | UCARRFERR PPM | UCARRFERR? | PPM | |
| | Frequency error judge | On | JCARRFERR ON | JCARRFERR? | ON | |
| | | Off | JCARRFERRL OFF | JCARRFERRL? | OFF | |
| | Frequency error limit | upper limit | ULCARRFERR f | ULCARRFERR? | f | f:Ø to 1ØØ [kHz, ppm] |
| | | | | ULCARRFERR? un | f | un:KHZ,PPM |
| Modulation Analysis | RMS phase error measurement | On | MPHASEERR ON | MPHASEERR? | ON | |
| | | Off | MPHASEERR OFF | MPHASEERR? | OFF | |
| | RMS phase error judge | On | JPHASEERR ON | JPHASEERR? | ON | |
| | | Off | JPHASEERR OFF | JPHASEERR? | OFF | |
| | RMS phase error limit | upper limit | ULPHASEERR r | ULPHASEERR? | r | r:Ø.Ø to 1ØØ.Ø [deg] |
| | Peak phase error measurement | On | MPPHASEERR ON | MPPHASEERR? | ON | |
| | | Off | MPPHASEERR OFF | MPPHASEERR? | OFF | |
| | Peak phase error judge | On | JPPHASEERR ON | JPPHASEERR? | ON | |
| | | Off | JPPHASEERR OFF | JPPHASEERR? | OFF | |
| | Peak Phase Error limit | upper limit | ULPPHASEERR r | ULPPHASEERR? | r | r:Ø.Ø to 1ØØ.Ø [deg] |
| | Magnitude error measurement | On | MMAGTDERR ON | MMAGTDERR? | ON | |
| | | Off | MMAGTDERR OFF | MMAGTDERR? | OFF | |
| | Magnitude errror judge | On | JMAGTDERR ON | JMAGTDERR? | ON | |
| | | Off | JMAGTDERR OFF | JMAGTDERR? | OFF | |
| | Magnitude error limit | upper limit | ULMAGTDERR r | ULMAGTDERR? | r | r:Ø.Ø to 1ØØ.Ø [%] |
| RF power | TX power measurement | On | MTXPWR ON | MTXPWR? | ON | |
| | | Off | MTXPWR OFF | MTXPWR? | OFF | |
| | TX power unit | dBm | UTXPWR DBM | UTXPWR? | DBM | |
| | | W | UTXPWR WATT | UTXPWR? | WATT | |
| | TX power judge | On | JTXPWR ON | JTXPWR? | ON | |
| | | Off | JTXPWR OFF | JTXPWR? | OFF | |
| | TX power limit | Lower limit | LLTXPWR ℓ | LLTXPWR? | ℓ | ℓ :-8Ø.Ø to +43.Ø [dBm] |
| | | | | LLTXPWR? un | ℓ | un:DBM,WATT |
| | | Upper limit | ULTXPWR ℓ | ULTXPWR? | ℓ | ℓ :-8Ø.Ø to +43.Ø [dBm] |
| | | | | ULTXPWR? un | ℓ | un:DBM,WATT |
| | Carrier off power measurement | On | MOFFPWR ON | OFFPWR | ON | |
| | | Off | MOFFPWR OFF | OFFPWR | OFF | |
| | Carrier off power unit | dBm | UOFFPWR DBM | OFFPWR | DBM | |
| | | W | UOFFPWR WATT | OFFPWR | WATT | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| RF power | Carrier off power limit | Upper limit | ULOFFPWR ℓ | ULOFFPWR?<br>ULOFFPWR? un | ℓ<br>ℓ | ℓ :ØØ to +43.Ø [dBm]<br>un:DBM,WATT |
| | On/Off ratio measurement | On<br>Off | MRATIO ON<br>MRATIO OFF | MRATIO?<br>MRATIO? | ON<br>OFF | |
| | On/Off ratio judge | On<br>Off | JRATIO ON<br>JRATIO OFF | JRATIO?<br>JRATIO? | ON<br>OFF | |
| | On/Off ratio limit | Lower limit | LLRATIO ℓ | LLRATIO? | ℓ | ℓ :Ø.Ø to 1ØØ.Ø [dB] |
| | Max Power measurement | On<br>Off | MMAXPWR ON<br>MMAXPWR OFF | MMAXPWR?<br>MMAXPWR? | ON<br>OFF | |
| | Max Power judge | On<br>Off | JMAXPWR ON<br>JMAXPWR OFF | JMAXPWR?<br>JMAXPWR? | ON<br>OFF | |
| | Max Power limit | Upper limit | ULMAXPWR r | ULMAXPWR? | r | r:Ø.Ø to +1Ø.Ø [dB] |
| | Min Power measurement | On<br>Off | MMINPWR ON<br>MMINPWR OFF | MMINPWR?<br>MMINPWR? | ON<br>OFF | |
| | Min Power judge | On<br>Off | JMINPWR ON<br>JMINPWR OFF | JMINPWR?<br>JMINPWR? | ON<br>OFF | |
| | Min Power limit | Lower limit | LLMINPWR r | LLMINPWR? | r | r:-1ØØ.Ø to Ø.Ø [dB] |
| | Template Pass/Fail | On<br>Off | MTEMPPASS ON<br>MTEMPPASS OFF | MTEMPPASS?<br>MTEMPPASS? | ON<br>OFF | |
| | Template Pass/Fail zone | On<br>Off | LTEMPPASS ON<br>LTEMPPASS BOTH | LTEMPPASS?<br>LTEMPPASS? | ON<br>BOTH | |
| | Time alignment measurement | On<br>Off | MTMALMENT ON<br>MTMALMENT OFF | MTMALMENT?<br>MTMALMENT? | ON<br>OFF | |
| | Time alignment judge | On<br>Off | JTMALMENT ON<br>JTMALMENT OFF | JTMALMENT?<br>JTMALMENT? | ON<br>OFF | |
| | Time alignment limit | Lower limit<br>Upper limit | LLTMALMENT r<br>ULTMALMENT r | LLTMALMENT?<br>ULTMALMENT? | r<br>r | r:-64.ØØ to 1.ØØ<br>r:-64.ØØ to 1.ØØ |
| Call processing report & measure | RX level report measurement | On<br>Off | MRXLEVEL ON<br>MRXLEVEL OFF | MRXLEVEL?<br>MRXLEVEL? | ON<br>OFF | |
| | RX level report judge | On<br>Off | JRXLEVEL ON<br>JRXLEVEL OFF | JRXLEVEL?<br>JRXLEVEL? | ON<br>OFF | |
| | RX level report limit | Lower limit<br>Upper limit | LLRXLEVEL n<br>ULRXLEVEL n | LLRXLEVEL?<br>ULRXLEVEL? | n<br>n | n: Ø to 63<br>n: Ø to 63 |
| | RX quality report measurement | On<br>Off | MRXQUALITY ON<br>MRXQUALITY OFF | MRXQUALITY?<br>MRXQUALITY? | ON<br>OFF | |
| | RX quality report judge | On<br>Off | JRXQUALITY ON<br>JRXQUALITY OFF | JRXQUALITY?<br>JRXQUALITY? | ON<br>OFF | |
| | RX quality report limit | Lower limit<br>Upper limit | LLRXQUALITY n<br>ULRXQUALITY n | LLRXQUALITY?<br>ULRXQUALITY? | n<br>n | n: Ø to 7<br>n: Ø to 7 |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Call processing report & measure | MS power report measurement | On | MMSPWR ON | MMSPWR? | ON | |
| | | Off | MMSPWR OFF | MMSPWR? | OFF | |
| | MS power report judge | On | JMSPWR ON | JMSPWR? | ON | |
| | | Off | JMSPWR OFF | JMSPWR? | OFF | |
| | Timing advance report measurement | On | MTMADVANCE ON | MTMADVANCE? | ON | |
| | | Off | MTMADVANCE OFF | MTMADVANCE? | OFF | |
| | Timing advance report judge | On | JTMADVANCE ON | JTMADVANCE? | ON | |
| | | Off | JTMADVANCE OFF | JTMADVANCE? | OFF | |
| RF power vs time | Leading portion measurement | On | MPTLEAD n, ON | MPTLEAD? n | ON | n: 1 to 5 |
| | | Off | MPTLEAD n, OFF | MPTLEAD? n | OFF | n: 1 to 5 |
| | Leading portion judge | On | JPTLEAD n, ON | JPTLEAD? n | ON | n: 1 to 5 |
| | | Off | JPTLEAD n, OFF | JPTLEAD? n | OFF | n: 1 to 5 |
| | Leading portion limit | Lower limit | LLPTLEAD n, ℓ | LLPTLEAD? n | ℓ | ℓ:-1ØØ to 1Ø[dB] |
| | | Upper limit | ULPTLEAD n, ℓ | ULPTLEAD? n | ℓ | ℓ:-1ØØ to 1Ø[dB] |
| | Trailing portion measurement | On | MPTTRAIL n, ON | MPTTRAIL? n | ON | n: 1 to 5 |
| | | Off | MPTTRAIL n, OFF | MPTTRAIL? n | OFF | n: 1 to 5 |
| | Trailing portion judge | On | JPTTRAIL n, ON | JPTTRAIL? n | ON | n: 1 to 5 |
| | | Off | JPTTRAIL n, OFF | JPTTRAIL? n | OFF | n: 1 to 5 |
| | Trailing portion limit | Lower limit | LLPTTRAIL n, ℓ | LLPTTRAIL? n | ℓ | ℓ:-1ØØ to 1Ø[dB] |
| | | Upper limit | ULPTTRAIL n, ℓ | ULPTTRAIL? n | ℓ | ℓ:-1ØØ to 1Ø[dB] |
| Output RF spectrum | Switching transients unit | dBm | UADJCH DBM | UADJCH? | DBM | |
| | | dB | UADJCH DB | UADJCH? | DB | |
| | Output RF spectrum measure | On | MADJCH ps, ON | MADJCH? ps | ON | ps:OF0,OF1ØØ,OF2ØØ, OF25Ø,OF4ØØ,OF6ØØ, OF8ØØ,OF1ØØØ, OF14ØØ,OF16ØØ, OF18ØØ,OF2ØØØ |
| | | Off | MADJCH ps, OFF | MADJCH? ps | OFF | |
| | Output RF spectrum judge | | JADJCH ps, ON | JADJCH? ps | ON | |
| | | | JADJCH ps, OFF | JADJCH? ps | OFF | |
| | Output RF spectrum Upper limit | Modulation | ULMODPWR ps, ℓ | ULMODPWR? ps | ℓ | ℓ:-1ØØ to 1Ø.Ø [dB] -1ØØ to +4Ø.Ø [dBm] |
| | | Switching | ULSWPWR ps, ℓ | ULSWPWR? ps | ℓ | |
| Standard set up | Standard | | AITEM STD | --- | --- | |

(9) TX all measure command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Strage mode | Normal | | STRAGE NRM | STRAGE? | NRM | |
| | Average | | STRAGE AVG | STRAGE? | AVG | |
| | Wide dynamic range | | STRAGE WIDE | STRAGE? | WIDE | |
| | Average on | On | VAVG ON<br>VAVG 1<br>KSG | ---<br>---<br>--- | ---<br>---<br>--- | |
| | Average off | Off | VAVG OFF<br>VAVG Ø<br>KSH | ---<br>---<br>--- | ---<br>---<br>--- | |
| | Average count | | AVR n<br>VAVG n | AVG?<br>VAVG? | n<br>n | n:2 to 9999<br>n:2 to 9999 |
| | Reflesh interval | | INTVAL EVERY<br>INTVAL ONCE | INTVAL?<br>INTVAL? | EVERY<br>ONCE | |
| Calibration | Calibration | | PWRCAL<br>CALVAL ℓ | PWRCAL?<br>CALVAL? | ℓ<br>f, ℓ | f=0: Not calibrated<br>f=1: Internal calibration<br>f=2: External calibration<br>ℓ : -10.00 to 10.00 |
| | Calibration cancel | | CALCANCEL | --- | --- | |
| | Adjust range | | ADJRNG | --- | --- | |
| Measure judegement | Carrier frequency error | | --- | JCARRFERR? | b | b:PASS,FAIL |
| | RMS phase error | | --- | JPHASEERR? | b | |
| | Peak phase error | | --- | JPPHASEERR? | b | |
| | RMS magnitude error | | --- | JMAGDERR? | b | |
| | TX power | | --- | JTXPWR? | b | |
| | Carrier off power | | --- | JOFFPWR? | b | |
| | On/Off ratio | | --- | JRATIO? | b | |
| | Template | | --- | TEMPPASS? | b | |
| | Time alignment | | --- | JTMALMENT? | b | |
| | RX level | | --- | JRXLEVEL? | b | |
| | RX quality | | --- | JRXQUALITY? | b | |
| | MS power level | | --- | JMSPWR? | b | |
| | Timing advance | | --- | JTMADVAMCE? | b | |
| | Leading RF power | | --- | JPTLEAD? n | b | n:1 to 5 |
| | Trailing RF power | | --- | JPTTRAIL? n | b | n:1 to 5 |
| | Output RF spectrum | FØ to F2ØØØ | --- | JADJCH? ps | b | ps:OFØ,OF1ØØ,OF2ØØ,<br>OF25Ø,OF4ØØ,OF6ØØ,<br>OF8ØØ,OF1ØØØ,<br>OF14ØØ,OF16ØØ,<br>OF18ØØ,OF2ØØØ |
| Total judgement | Total judgement | PASS<br>FAIL | ---<br>--- | JTOTAL?<br>JTOTAL? | PASS<br>FAIL | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Measurement result (Multi response) | Modulation analysis | | --- | ALLMEAS? MODANAL | n,rØ,n,r1,n,r2,n,r3, n,r4 | n: Ø:PASS<br>4:FAIL<br>9:Measurement Off<br>rØ:Carrier freq.<br>r1:Carrier freq. error<br>r2:RMS phase error<br>r3:Peak phase error<br>r4:RMS magnitude error |
| | RF power | | --- | ALLMEAS? RFPWR | n,rØ,n,r1,n,r2,n,r3, n,r4,n,r5,n,r6,n,r7 | n: Ø:PASS<br>4:FAIL<br>9:Measurement Off<br>rØ:TX Power<br>r1:Carrier Off power<br>r2:On/Off ratio<br>r3:Mod Power<br>r4:Time alignment<br>r5:Template PASS/FAIL<br>r6:Max Power<br>r7:Min Power |
| | RF power vs time | | --- | ALLMEAS? PWRTM | n,rØ,n,r1,n,r2,n,r3, n,r4,n,r5,n,r6,n,r7, n,r8,n,r9 | n: Ø:PASS<br>4:FAIL<br>9:Measurement Off<br>rØ: Power at -28us<br>r1: Power at -18us<br>r2: Power at -1Øus<br>r3: Power at -5us<br>r4: Power at Øus<br>r5: Power at 542.8us<br>r6: Power at 547.8us<br>r7: Power at 552.8us<br>r8: Power at 56Ø.8us<br>r9: Power at 57Ø.8us |
| | Modulation analysis & RF power | | --- | ALLMEAS? MODRF, nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø,n11, n12, n13, n14, n15, n16, n17, n19, n2Ø, n21 | PFnØ, rØ, PFn1, r1<br>:<br>: | returns selected measurement results see *1 |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Measurement result (Multi response) | Call Processing report | | --- | ALLMEAS? CALLP | n,rØ,n,r1,n,r2,n,r3 | n: Ø:PASS<br>4:FAIL<br>9:Measurement Off<br>rØ:RX level<br>r1:RX quality<br>r2:MS power level<br>r3:Timing advance |
| | | | --- | ALLMEAS? CALLP nØ, n1, n2, n3 | PFnØ, rØ, PFn1, r1, PFn2, r2, PFn3, r3 | returns selected measurement results see *2 |
| | Output RF Spectrum | | --- | ALLMEAS? RFSPEC | PFnØ, MLnØ, MUnØ, SLnØ, SUnØ, PFn1, MLn1, MUn1, SLn1, SUn1, : | returns all measurement results see *3 |
| | | | --- | ALLMEAS? RFSPEC nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12 | PFnØ, MLnØ, MUnØ SLnØ, SUnØ, PFn1, MLn1, MUn1, SLn1, SUn1, : | returns selected measurement results see *3 |
| Measurement result (Single response) | See each measurement screen for result | | | | | |

*1 Modulation analysis & RF power Query in TX All Measure Screen

Query format example:

ALLMEAS? MODRF, nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12, n13, n14, n15, n16, n17, n18, n19, n2Ø, n21

nØ to n21 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=22)

Actual query example:

ALLMEAS? MODRF, Ø, 1, 1, Ø, Ø, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of Carrier freq error, RMS Phase error and TX power

Response format:

PFnØ, rØ, PFn1, r1, .....

PF: Ø=Pass, 4=Fail, 9=Measurement off

rØ: Carrier freq

r1: Carrier freq error

r2: RMS phase error

r3: Peak phase error

r4: Magnitude error

r5: TX power

r6: Carrier off power

r7: On/Off ratio

r8: MAX power

r9: MIN power

r1Ø: Time alignment

r11: Template

r12: Power at -28us

r13: Power at -18us

r14: Power at -1Øus

r15: Power at -5us

r16: Power at Øus

r17: Power at 542.8us

r18: Power at 547.8us

r19: Power at 552.8us

r2Ø: Power at 56Ø.8us

r21: Power at 57Ø.8us

Note: The values of r17 to r21 are changed as follows when the measuring Object is set ot RACH.

542.8 µs → 321.2 µs

547.8 µs → 326.2 µs

552.8 µs → 331.2 µs

560.8 µs → 339.2 µs

570.8 µs → 349.2 µs

Actual Response example: (Carrier freq error, RMS Phase error and TX power)

Ø, Ø.1, 2.82, Ø, 28.24

*2 Call Processing report Query in TX All Measure Screen

Query format example:

ALLMEAS? CALLP, nØ, n1, n2, n3

nØ to n3 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=5)

Actual query example:

ALLMEAS? CALLP, 1, Ø, 1, Ø

This query returns measurement results of RX level and MS Power level

Response format:

PFnØ, rØ, PFn1, r1, .....

PF: Ø=Pass, 4=Fail, 9=Measurement off

rØ: RX level

r1: RX quality

r2: MS power level

r3: Timing advance

Actual Response example: (RX level and MS Power level)

Ø, 23, Ø, 8

*3 Output RF Spectrum Query in TX All Measure Screen

Query format example:

ALLMEAS? RFSPEC, nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12

nØ to n12 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=14)

Actual query example:

ALLMEAS? RFSPEC, Ø, 1, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of 1ØØ kHz and 2ØØ kHz

Response format:

PFnØ, MLnØ, MUnØ, SLnØ, SUnØ, PFn1, MLn1, MUn1, SLn1, SUn1, .....

PF: Ø=Pass, 4=Fail, 9=Measurement off

ML: Modulation Lower

MU: Modulation Upper

SL: Switching Lower

SU: Switching Upper

Actual Response example: (Offset=1ØØ kHz and 2ØØ kHz)

Ø, -7.42, -5.47, 16.5Ø, 16.96, Ø, -33.64, -35.38, -5.92, -7.9Ø

### (10) Optimized TX measurement

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Optimized TX measurement | Measurement item selection | | MOPTXMEAS an, rØ, r1, r2,..., r58 | MOPTXMEAS? | an, rØ, r1, r2,..., r58 | *1, *2 |
| | Perform measurement | | SWPOPTXMEAS | POTXMEAS? | rØ, r1, r2,..., r58 | *3, *4, *5, *6 |

*1 an: average count (1 to 12) Initial Setting=10
pn: 0= measurement off 1=measurement on Initial Setting = 1, 0, 0, ..., 0

The corresponding measurement items are as forrows.

Corresponding measurement items

| | |
|---|---|
| p0: Average Freq. Error | p31: Min Power vs Time at 0 µs |
| p1: Max Freq. Error | p32: Average Power vs Time at 542.8 µs |
| p2: Average RMS Phase Error | p33: Max Power vs Time at 542.8 µs |
| p3: Max RMS Phase Error | p34: Min Power vs Time at 542.8 µs |
| p4: Average Peak Phase Error | p35: Average Power vs Time at 547.8 µs |
| p5: Max Peak Phase Error | p36: Max Power vs Time at 547.8 µs |
| p6: Average Tx Power | p37: Min Power vs Time at 547.8 us |
| p7: Max Tx Power | p38: Average Power vs Time at 552.8 µs |
| p8: Min Tx Power | p39: Max Power vs Time at 552.8 µs |
| p9: Average carrier on/off ratio | p40: Min Power vs Time at 552.8 µs |
| p10: Max carrier on/off ratio | p41: Average Power vs Time at 560.8 µs |
| p11: Min carrier on/off ratio | p42: Max Power vs Time at 560.8 µs |
| p12: Average Time Alignment | p43: Min Power vs Time at 560.8 µs |
| p13: Max Time Alignment | p44: Average Power vs Time at 570.8 µs |
| p15: Max Power in on portion | p45: Max Power vs Time at 570.8 µs |
| p16: Min Power in on portion | p46: Min Power vs Time at 570.8 µs |
| p17: Average Power vs Time at -28 µs | p47: Average Spectrum due to modulation at -400 kHz |
| p18: Max Power vs Time at -28 µs | p48: Max Spectrum due to modulation at -400 kHz |
| p19: Min Power vs Time at -28 µs | p49: Min Spectrum due to modulation at -400 kHz |
| p20: Average Power vs Time at -18 µs | p50: Average Spectrum due to modulation at +400 kHz |
| p21: Max Power vs Time at -18 µs | p51: Max Spectrum due to modulation at +400 kHz |
| p22: Min Power vs Time at -18 µs | p52: Min Spectrum due to modulation at +400 kHz |
| p23: Average Power vs Time at -10 µs | p53: Average Spectrum due to switching at -400 kHz |
| p24: Max Power vs Time at -10 µs | p54: Max Spectrum due to switching at -400 kHz |
| p25: Min Power vs Time at -10 µs | p55: Min Spectrum due to switching at -400 kHz |
| p26: Average Power vs Time at -5 µs | p56: Average Spectrum due to switching at +400 kHz |
| p27: Max Power vs Time at -5 µs | p57: Max Spectrum due to switching at +400 kHz |
| p28: Min Power vs Time at -5 µs | p58: Min Spectrum due to switching at +400 kHz |
| p29: Average Power vs Time at 0 µs | p59: Average Originoffset |
| p30: Max Power vs Time at 0 µs | p60: MAX Originoffset |

*2 MX880215A returns no error when the number of parameter is less than 62.

*3 If corresponding pn (item) is 0, rn (result) is not returned.
e.g. if p1 and p3 is 0 (i.e. off), returned response is r0, r2, r4, r5, ...., r60

*4 Unit of Freq Error and Spectrum due to switching are determined by the setting in Select All Measure Item Screen.

*5 The next GPIB msg after "SWPOPTXMEAS" is not accepted by the end of measurement to avoid reading previous measurement result. i.e. No need to send "SWP" command after "SWPOPTXMEAS".

*6 The ORIGIN OFFSET measurement of p59 and p60 requires the TCH test pattern of E0. (See paragraph 4.3.7 of Panel Operation)

Example:

MOPTXMEAS 1Ø, Ø, Ø, 1, Ø, Ø, Ø

The corresponding Optimized TX Measurement 2 Modulation Analysis and Power Mesurement items are as follows

Table 1 Corresponding measurement item pn(Modulation & Power)

| | | | | | |
|---|---|---|---|---|---|
| P0 | bit-2 | Average frequency error | P9 | bit-2 | Average power vs time at -10 µs |
| | bit-1 | Max frequency error | | bit-1 | Max power vs time at -10 µs |
| | bit-0 | – | | bit-0 | Min power vs time at -10 µs |
| P1 | bit-2 | Average RMS phase error | P10 | bit-2 | Average power vs time at -5 µs |
| | bit-1 | Max RMS phase error | | bit-1 | Max power vs time at -5 µs |
| | bit-0 | – | | bit-0 | Min power vs time at -5 µs |
| P2 | bit-2 | Average peak phase error | P11 | bit-2 | Average power vs time at 0 µs |
| | bit-1 | Max peak phase error | | bit-1 | Max power vs time at 0 µs |
| | bit-0 | – | | bit-0 | Min power vs time at 0 µs |
| P3 | bit-2 | Average Tx power | P12 | bit-2 | Average power vs time at 542.8 µs |
| | bit-1 | Max Tx power | | bit-1 | Max power vs time at 542.8 µs |
| | bit-0 | Min Tx power | | bit-0 | Min power vs time at 542.8 µs |
| P4 | bit-2 | Average carrier on/off ratio | P13 | bit-2 | Average power vs time at 547.8 µs |
| | bit-1 | Max carrier on/off ratio | | bit-1 | Max power vs time at 547.8 µs |
| | bit-0 | Min carrier on/off ratio | | bit-0 | Min power vs time at 547.8 µs |
| P5 | bit-2 | Average time alignment | P14 | bit-2 | Average power vs time at 552.8 µs |
| | bit-1 | Max time alignment | | bit-1 | Max power vs time at 552.8 µs |
| | bit-0 | Min time alignment | | bit-0 | Min power vs time at 552.8 µs |
| P6 | bit-2 | – | P15 | bit-2 | Average power vs time at 560.8 µs |
| | bit-1 | Max power in on portion | | bit-1 | Max power vs time at 560.8 µs |
| | bit-0 | Min power in on portion | | bit-0 | Min power vs time at 560.8 µs |
| P7 | bit-2 | Average power vs time at -28 µs | P16 | bit-2 | Average power vs time at 570.8 µs |
| | bit-1 | Max power vs time at -28 µs | | bit-1 | Max power vs time at 570.8 µs |
| | bit-0 | Min power vs Time at -28 µs | | bit-0 | Min power vs time at 570.8 µs |
| P8 | bit-2 | Average power vs time at -18 µs | P17 | bit-2 | Average origin-offset |
| | bit-1 | Max power vs time at -18 µs | | bit-1 | Max origin-offset |
| | bit-0 | Min power vs time at -18 µs | | bit-0 | – |

*2

RCA returns no error when the number of parameter is less than 17.
e.g. MOPTX2MODPWR 1Ø,6,6,6,7,7,7,3,7,7

*3

The next GPIB msg after "SWPOPTX2MODPWR" is not accepted by the end if measurement to avoid reading previous measurement result. i.e.No need to send "SWP" command after "SWPOPTX2MODPWR".

*4

If corresponding pn(item) is Ø,rn(result) is not returns.
e.g. if p1 and p3 is Ø(i.e. bit–2=off,bit–1=off.bit–Ø=off),returned response is rØ-2,rØ-1,r1-1,r2-2,r2-1,r3-1,r4-2,r4-1,r4-Ø....,r17-1.

*5

Unit of Freq Error is determined by the setting in Select All Measure Item Screen.

*6

an: average count(1 to 9999) Initial Setting 1

pn: bit–2×4+bit–1×2+bit–Ø (Ø to 7)

bit–2/bit–1/bit–Ø: Ø=measurement off, 1=measurement on Initial Setting Ø

The corresponding Optimized TX Measurement 2 Output RF Spectrum are as follows

Table 2 Corresponding measurement item (ORFS) -1

| | | | | | |
|---|---|---|---|---|---|
| P0 | bit-2 | Average due to mod at -0 kHz | P13 | bit-2 | Average due to mod at +0 kHz |
| | bit-1 | Max due to mod at -0 kHz | | bit-1 | Max due to mod at +0 kHz |
| | bit-0 | Min due to mod at -0 kHz | | bit-0 | Min due to mod at +0 kHz |
| P1 | bit-2 | Average due to mod at -100 kHz | P14 | bit-2 | Average due to mod at +100 kHz |
| | bit-1 | Max due to mod at -100 kHz | | bit-1 | Max due to mod at +100 kHz |
| | bit-0 | Min due to mod at -100 kHz | | bit-0 | Min due to mod at +100 kHz |
| P2 | bit-2 | Average due to mod at -200 kHz | P15 | bit-2 | Average due to mod at +200 kHz |
| | bit-1 | Max due to mod at -200 kHz | | bit-1 | Max due to mod at +200 kHz |
| | bit-0 | Min due to mod at -200 kHz | | bit-0 | Min due to mod at +200 kHz |
| P3 | bit-2 | Average due to mod at -250 kHz | P16 | bit-2 | Average due to mod at +250 kHz |
| | bit-1 | Max due to mod at -250 kHz | | bit-1 | Max due to mod at +250 kHz |
| | bit-0 | Min due to mod at -250 kHz | | bit-0 | Min due to mod at +250 kHz |
| P4 | bit-2 | Average due to mod at -400 kHz | p17 | bit-2 | Average due to mod at +400 kHz |
| | bit-1 | Max due to mod at -400 kHz | | bit-1 | Max due to mod at +400 kHz |
| | bit-0 | Min due to mod at -400 kHz | | bit-0 | Min due to mod at +400 kHz |
| P5 | bit-2 | Average due to mod at -600 kHz | P18 | bit-2 | Average due to mod at +600 kHz |
| | bit-1 | Max due to mod at -600 kHz | | bit-1 | Max due to mod at +600 kHz |
| | bit-0 | Min due to mod at -600 kHz | | bit-0 | Min due to mod at +600 kHz |
| P6 | bit-2 | Average due to mod at -800 kHz | P19 | bit-2 | Average due to mod at +800 kHz |
| | bit-1 | Max due to mod at -800 kHz | | bit-1 | Max due to mod at +800 kHz |
| | bit-0 | Min due to mod at -800 kHz | | bit-0 | Min due to mod at +800 kHz |
| P7 | bit-2 | Average due to mod at -1000 kHz | P20 | bit-2 | Average due to mod at +1000 kHz |
| | bit-1 | Max due to mod at -1000 kHz | | bit-1 | Max due to mod at +1000 kHz |
| | bit-0 | Min due to mod at -1000 kHz | | bit-0 | Min due to mod at +1000 kHz |
| P8 | bit-2 | Average due to mod at -1200 kHz | P21 | bit-2 | Average due to mod at +1200 kHz |
| | bit-1 | Max due to mod at -1200 kHz | | bit-1 | Max due to mod at +1200 kHz |
| | bit-0 | Min due to mod at -1200 kHz | | bit-0 | Min due to mod at +1200 kHz |
| P9 | bit-2 | Average due to mod at -1400 kHz | P22 | bit-2 | Average due to mod at +1400 kHz |
| | bit-1 | Max due to mod at -1400 kHz | | bit-1 | Max due to mod at +1400 kHz |
| | bit-0 | Min due to mod at -1400 kHz | | bit-0 | Min due to mod at +1400 kHz |
| P10 | bit-2 | Average due to mod at -1600 kHz | P23 | bit-2 | Average due to mod at +1600 kHz |
| | bit-1 | Max due to mod at -1600 kHz | | bit-1 | Max due to mod at +1600 kHz |
| | bit-0 | Min due to mod at -1600 kHz | | bit-0 | Min due to mod at +1600 kHz |
| P11 | bit-2 | Average due to mod at -1800 kHz | P24 | bit-2 | Average due to mod at +1800 kHz |
| | bit-1 | Max due to mod at -1800 kHz | | bit-1 | Max due to mod at +1800 kHz |
| | bit-0 | Min due to mod at -1800 kHz | | bit-0 | Min due to mod at +1800 kHz |
| P12 | bit-2 | Average due to mod at -2000 kHz | P25 | bit-2 | Average due to mod at +2000 kHz |
| | bit-1 | Max due to mod at -2000 kHz | | bit-1 | Max due to mod at +2000 kHz |
| | bit-0 | Min due to mod at -2000 kHz | | bit-0 | Min due to mod at +2000 kHz |

Table 2 Corresponding measurement item (ORFS) -2

| | | | | | |
|---|---|---|---|---|---|
| P26 | bit-2 | Average due to sw at -0 kHz | P39 | bit-2 | Average due to sw at +0 kHz |
| | bit-1 | Max due to sw at -0 kHz | | bit-1 | Max due to sw at +0 kHz |
| | bit-0 | Min due to sw at -0 kHz | | bit-0 | Min due to sw at +0 kHz |
| P27 | bit-2 | Average due to sw at -100 kHz | P40 | bit-2 | Average due to sw at +100 kHz |
| | bit-1 | Max due to sw at -100 kHz | | bit-1 | Max due to sw at +100 kHz |
| | bit-0 | Min due to sw at -100 kHz | | bit-0 | Min due to sw at +100 kHz |
| P28 | bit-2 | Average due to sw at -200 kHz | P41 | bit-2 | Average due to sw at +200 kHz |
| | bit-1 | Max due to sw at -200 kHz | | bit-1 | Max due to sw at +200 kHz |
| | bit-0 | Min due to sw at -200 kHz | | bit-0 | Min due to sw at +200 kHz |
| P29 | bit-2 | Average due to sw at -250 kHz | P42 | bit-2 | Average due to sw at +250 kHz |
| | bit-1 | Max due to sw at -250 kHz | | bit-1 | Max due to sw at +250 kHz |
| | bit-0 | Min due to sw at -250 kHz | | bit-0 | Min due to sw at +250 kHz |
| P30 | bit-2 | Average due to sw at -400 kHz | P43 | bit-2 | Average due to sw at +400 kHz |
| | bit-1 | Max due to sw at -400 kHz | | bit-1 | Max due to sw at +400 kHz |
| | bit-0 | Min due to sw at -400 kHz | | bit-0 | Min due to sw at +400 kHz |
| P31 | bit-2 | Average due to sw at -600 kHz | P44 | bit-2 | Average due to sw at +600 kHz |
| | bit-1 | Max due to sw at -600 kHz | | bit-1 | Max due to sw at +600 kHz |
| | bit-0 | Min due to sw at -600 kHz | | bit-0 | Min due to sw at +600 kHz |
| P32 | bit-2 | Average due to sw at -800 kHz | P45 | bit-2 | Average due to sw at +800 kHz |
| | bit-1 | Max due to sw at -800 kHz | | bit-1 | Max due to sw at +800 kHz |
| | bit-0 | Min due to sw at -800 kHz | | bit-0 | Min due to sw at +800 kHz |
| P33 | bit-2 | Average due to sw at -1000 kHz | P46 | bit-2 | Average due to sw at +1000 kHz |
| | bit-1 | Max due to sw at -1000 kHz | | bit-1 | Max due to sw at +1000 kHz |
| | bit-0 | Min due to sw at -1000 kHz | | bit-0 | Min due to sw at +1000 kHz |
| P34 | bit-2 | Average due to sw at -1200 kHz | P47 | bit-2 | Average due to sw at +1200 kHz |
| | bit-1 | Max due to sw at -1200 kHz | | bit-1 | Max due to sw at +1200 kHz |
| | bit-0 | Min due to sw at -1200 kHz | | bit-0 | Min due to sw at +1200 kHz |
| P35 | bit-2 | Average due to sw at -1400 kHz | P48 | bit-2 | Average due to sw at +1400 kHz |
| | bit-1 | Max due to sw at -1400 kHz | | bit-1 | Max due to sw at +1400 kHz |
| | bit-0 | Min due to sw at -1400 kHz | | bit-0 | Min due to sw at +1400 kHz |
| P36 | bit-2 | Average due to sw at -1600 kHz | P49 | bit-2 | Average due to sw at +1600 kHz |
| | bit-1 | Max due to sw at -1600 kHz | | bit-1 | Max due to sw at +1600 kHz |
| | bit-0 | Min due to sw at -1600 kHz | | bit-0 | Min due to sw at +1600 kHz |
| P37 | bit-2 | Average due to sw at -1800 kHz | P50 | bit-2 | Average due to sw at +1800 kHz |
| | bit-1 | Max due to sw at -1800 kHz | | bit-1 | Max due to sw at +1800 kHz |
| | bit-0 | Min due to sw at -1800 kHz | | bit-0 | Min due to sw at +1800 kHz |
| P38 | bit-2 | Average due to sw at -2000 kHz | P51 | bit-2 | Average due to sw at +2000 kHz |
| | bit-1 | Max due to sw at -2000 kHz | | bit-1 | Max due to sw at +2000 kHz |
| | bit-0 | Min due to sw at -2000 kHz | | bit-0 | Min due to sw at +2000 kHz |

*7

RCA returns no error when the number of parameter is less than 51.

e.g. MOPTX2ORFS 1Ø,7,7,7,7,7,7,7,7,7,7

*8

The next GPIB msg after "SWPOPTX2ORFS" is not accepted by the end if measurement to avoid reading previous measurement result. i.e.No need to send "SWP" command after "SWPOPTX2ORFS".

*9

If corresponding pn(item) is Ø,rn(result) is not returns.

e.g. if p1 and p3 is Ø(i.e. bit–2=off,bit–1=off,bit–Ø=off),returned response is rØ-2,rØ-1,rØ-Ø,r1-1,r2-2,r2-1, r2-Ø,r3-1,r4-2,r4-1,r4-Ø,...,r51-Ø

*10

Unit of Spectrum due to switching is determined by the setting in Select All Measure Item Screen.

Example

1.Optimized TX Measurement 2 Modulation Analysis and RF Power

A case of measuring average and max of RMS phase error and average,max and min of TX power.

a. Setting the Measurement Items

```
OPTX2MODPWR 1ØØ,Ø,6,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

where average count is specified with 1ØØ.

b. Query the measurement item

```
OPTX2MODPWR?
–> 1ØØ,Ø,6,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

c. Execute measurement

```
SWPOPTX2MODPWR
```

d. Query the measurement results

```
MOPTX2MODPWR?
–> 3.65,3.7Ø,2Ø.Ø,2Ø.9,19.4
```

2.Optimized TX Measurement 2 Output RF Spectrum

A case of measuring average,max and min of power due to modulation and due to switching transient at ±400 kHz.

a. Setting the measurement Items

```
MOPTX2ORFS
1ØØ,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

where average count is specified with 1ØØ.

b. Query the measurement Items

```
OPTX2ORFS?
–> 1ØØ,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,
Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

c. Execute measurement

```
SWPOPTX2ORFS
```

d. Query the measurement results

```
MOPTX2ORFS?
–> -65.89,-63.66,-67.98,-65.89,-62.88,-7Ø.45,-64.82,-62.39,-66.96,-64.44,
-62.79,-65.93
```

## 2.5.6 RX tester command

- Program messages of the RX tester commands are valid in ranges defined on RX tester screen.
- Query messages of the RX tester commands are valid on all RX tester screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all measurement screens of the RX test. (See paragraph 2.5.4.)

(1) Setup RX meas parameter command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Data pattern | Pattern(CONTINUOUS) | PN9 | PAT PN9 | PAT? | PN9 | |
| | | bit | PAT bit | PAT? | bit | bit:ØØØØ to 1111 |
| | Pattern(MSNB) | | TESTPAT PATØ | TESTPAT? | PATØ | |
| | | | TESTPAT PAT1 | TESTPAT? | PAT1 | |
| | | | TESTPAT PAT2 | TESTPAT? | PAT2 | |
| | | | TESTPAT PAT3 | TESTPAT? | PAT3 | |
| | | | TESTPAT PAT4 | TESTPAT? | PAT4 | |
| | | | TESTPAT PAT5 | TESTPAT? | PAT5 | |
| | | | TESTPAT PAT6 | TESTPAT? | PAT6 | |
| | | | TESTPAT PAT7 | TESTPAT? | PAT7 | |
| | | | TESTPAT PAT8 | TESTPAT? | PAT8 | |
| | | | TESTPAT PAT9 | TESTPAT? | PAT9 | |
| | | | TESTPAT PN15 | TESTPAT? | PN15 | |
| | | | TESTPAT EØ | TESTPAT? | EØ | |
| | MS power level | | MSPWR n | MSPWR? | n | n:2 to 19 |
| BER Measure judge | FER measure judge | On | JBERMEAS FER,ON | JBERMEAS? FER | ON | |
| | | Off | JBERMEAS FER,OFF | JBERMEAS? FER | OFF | |
| | CRC measure judge | On | JBERMEAS FER,ON | JBERMEAS? FER | ON | Same Msg as FER |
| | | Off | JBERMEAS FER,OFF | JBERMEAS? FER | OFF | Same Msg as FER |
| | CIb measure judge | On | JBERMEAS CIB,ON | JBERMEAS? CIB | ON | |
| | | Off | JBERMEAS CIB,OFF | JBERMEAS? CIB | OFF | |
| | CII measure judge | On | JBERMEAS CII,ON | JBERMEAS? CII | ON | |
| | | Off | JBERMEAS CII,OFF | JBERMEAS? CII | OFF | |
| | FAST measure judge | On | JBERMEAS FAST, ON | JBERMEAS? FAST | ON | |
| | | Off | JBERMEAS FAST, OFF | JBERMEAS? FAST | OFF | |
| BER Sample | FER sample | | BERSAMPLE FER,n | BERSAMPLE? FER | n | n:Ø to 99999999 |
| | CRC sample | | BERSAMPLE FER,n | BERSAMPLE? FER | n | Same Msg as FER |
| | CIb sample | | BERSAMPLE CIB,n | BERSAMPLE? CIB | n | n:Ø to 99999999 |
| | CII sample | | BERSAMPLE CII,n | BERSAMPLE? CII | n | n:Ø to 99999999 |
| | FAST sample | | BERSAMPLE FAST, n | BERSAMPLE? FAST | n | n:Ø to 99999999 |
| BER event upper limit | FER event limit | | ULBEREVENT FER,n | ULBEREVENT? FER | n | n:Ø to 99999999 |
| | CRC event limit | | ULBEREVENT FER,n | ULBEREVENT? FER | n | Same Msg as FER |
| | CIb event limit | | ULBEREVENT CIB,n | ULBEREVENT? CIB | n | n:Ø to 99999999 |
| | CII event limit | | ULBEREVENT CII,n | ULBEREVENT? CII | n | n:Ø to 99999999 |
| | FAST event limit | | ULBEREVENT FAST,n | ULBEREVENT? FAST | n | n:Ø to 99999999 |
| User cal factor | Band 1 | | RXUCALBA1 ℓ | RXUCALBA1? | ℓ | ℓ :-3Ø.Ø to +3Ø.Ø dB |
| | Band 2 | | RXUCALBA2 ℓ | RXUCALBA2? | ℓ | ℓ :-3Ø.Ø to +3Ø.Ø dB |

(2) BER measure command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Frequency | Frequency | | RFREQ f | RFREQ? | f | f:Ø.3 to 3ØØØ[MHz] |
| | | | FR f | --- | --- | |
| | | | FC f | --- | --- | |
| | Channel | | CHAN n | CHAN? | n | n:Ø to 1Ø23 (1 to 124; GSM) |
| | Incremental step | Value | FIS f | FIS? | f | f:1[Hz] to 3ØØØ[MHz] |
| | | Up | FRS UP | --- | --- | |
| | | | UFR | --- | --- | |
| | | Down | FRS DN | --- | --- | |
| | | | DFR | --- | --- | |
| | Realative | reference value | --- | FRLR? | f | f:Ø.3 to 3ØØØ[MHz] |
| | | Value | --- | FRLV? | f | |
| | | On | FRL ON | FRL? | ON | |
| | | | FO | --- | --- | |
| | | Off | FRL OFF | FRL? | OFF | |
| | | | FF | --- | --- | |
| Level | Output level | | OLVL ℓ | OLVL? | ℓ | ℓ : -143 to -28[dBm]/Main- -143 to -3[dBm]/Aux |
| | | | OL ℓ | --- | --- | |
| | | | AP ℓ | --- | --- | |
| | Incremental step | Value | OLS ℓ | OLS? | ℓ | ℓ : Ø.1 to 8Ø.Ø[dB] |
| | | Up | OLS UP | --- | --- | |
| | | | UOL | --- | --- | |
| | | Down | OLS DN | --- | --- | |
| | | | DOL | --- | --- | |
| | Knob | Step up | OLK UP | --- | --- | |
| | | | TOL | --- | --- | |
| | | Step down | OLK DN | --- | --- | |
| | | | EOL | --- | --- | |
| | Output level resolution | Ø.1, 1, 1ØdB | OLR ℓ | OLR? | ℓ | ℓ : Ø.1, 1, 1Ø[dB] |
| | Relative | | --- | ORLR? | ℓ | |
| | | | --- | ORLV? | ℓ | |
| | | | ORL ON | ORL? | ON | |
| | | | LO | LO | --- | |
| | | | ORL OFF | ORL? | OFF | |
| | | | LF | LF | --- | |
| | Output level offset | | OOS ℓ | OOS? | ℓ | ℓ :-55.Ø to 55.Ø[dB] |
| | | | OOF ON | OOF? | ON | |
| | | | OOF OFF | OOF? | OFF | |
| | Output level ON/OFF | | LVL ON | LVL? | ON | |
| | | | RO | --- | --- | |
| | | | LVL OFF | LVL? | OFF | |
| | | | RF | --- | --- | |

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Level | Voltage display | EMF | VDSPL EMF | VDSPL? | EMF | |
| | | | SPØ3 | --- | --- | |
| | | TERM | VDSPL TERM | VDSPL? | TERM | |
| | | | SPØ4 | --- | --- | |
| | Level continuous mode | On | OCNT ON | OCNT? | ON | |
| | | Off | OCNT OFF | OCNT? | OFF | |
| | Unit | dBm | OLDBM | --- | --- | |
| | | | OLDM | --- | --- | |
| | | | APDBM | --- | --- | |
| | | | APDM | --- | --- | |
| | | dBµ | OLDBU | --- | --- | |
| | | | OLDU | --- | --- | |
| | | | APDBU | --- | --- | |
| | | | APDU | --- | --- | |
| | Calibration | | CAL | --- | --- | |
| Modulation | Modulation | On | MOD ON | MOD? | ON | |
| | | Off | MOD OFF | MOD? | OFF | |
| Bit error rate measure | Start/Stop | Start | BERSA | --- | --- | |
| | | Stop | BERSO | --- | --- | |
| | Loop Back Type | FE | LBTYPE FE | LBTYPE? | FE | |
| | | NoFE | LBTYPE NOFE | LBTYPE? | NOFE | |
| | | FAST | LBTYPE FAST | LBTYPE? | FAST | |
| | BER Sample | FER | BERSAMPLE FER,n | BERSAMPLE? FER | n | n:Ø to 99999999 |
| | | CRC | BERSAMPLE FER,n | BERSAMPLE? FER | n | Same Msg as FER |
| | | CIb | BERSAMPLE CIB,n | BERSAMPLE? CIB | n | n:Ø to 99999999 |
| | | CII | BERSAMPLE CII,n | BERSAMPLE? CII | n | n:Ø to 99999999 |
| | | FAST | BERSAMPLE FAST,n | BERSAMPLE? FAST | n | n:Ø to 99999999 |
| Measue result | Error rate | FER | --- | BERRATE? FER | r | |
| | | CRC | --- | BERRATE? CRC | r | |
| | | CIb | --- | BERRATE? CIB | r | |
| | | CII | --- | BERRATE? CII | r | |
| | | FAST | --- | BERRATE? FAST | r | |
| | Error event | FER | --- | BEREVENT? FER | n | |
| | | CRC | --- | BEREVENT? CRC | n | |
| | | CIb | --- | BEREVENT? CIB | n | |
| | | CII | --- | BEREVENT? CII | n | |
| | | FAST | --- | BEREVENT? FAST | n | |
| | BER receive | FER | --- | BERRECEIVE? FER | n | |
| | | CRC | --- | BERRECEIVE? CRC | n | |
| | | CIb | --- | BERRECEIVE? CIB | n | |
| | | CII | --- | BERRECEIVE? CII | n | |
| | | FAST | --- | BERRECEIVE? FAST | n | |
| | RX Level | | | RXLEVEL? | n | |
| | RX Quality | | | RXQUALITY? | n | |
| Meaurement result (Multi response) | | | ---- | BERMEAS? | rØ, r1, r2, r3, r4, r5, r6, r7, r8 | returns all measurement results see *1 |
| | | | ---- | BERMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8 | rØ, r1, r2, r3, r4, r5, r6, r7, r8 | returns selected measurement results see *1 |

*1 Multi response

Query format example:

BERMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8

nØ to n8 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=9)

Actual query example:

BERMEAS? 1, Ø, Ø, 1, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of Error rate (FER/CRC/FAST) and Error event (FER/CRC/FAST)

Response format:

rØ, r1, r2, r3, r4, r5, r6, r7, r8

rØ: Error rate (FER/CRC/FAST)

r1: Error rate (CIb)

r2: Error rate (CII)

r3: Error event (FER/CRC/FAST)

r4: Error event (CIb)

r5: Error event (CII)

r6: BER sample (FER/CRC/FAST)

r7: BER sample (CIb)

r8: BER sample (CII)

Note: r0, r3, r6 indicate one measurement result from FER or CRC or FAST by the Loop Back Type.

Actual Response example: (Error rate (FER/CRC/FAST) and Error event (FER/CRC/FAST))

Ø.ØØØ, Ø

## 2.5.7 Call processing command

- Program messages of the Call processing commands are valid in ranges defined on Call processing test screen.
- Query messages of the Call processing commands are valid on all Call processing test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all measurement screens of the Call processing test. (See paragraph 2.5.4.)

(1) Setup Call processing parameter command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Network ID | Ncc | | NIDNCC | NIDNCC? | n | n:Ø to 7 |
| | Bcc | | NIDBCC | NIDBCC? | n | n:Ø to 7 |
| Location ID | MCC | | LIDMCC | LIDMCC? | n | n:Ø to 999 |
| | MNC | | LIDMNC | LIDMNC? | n | n:Ø to 99 |
| | LAC | | LIDLAC | LIDLAC? | n | n:Ø to65535 |
| Neighbor cell allocation | | | CALLCA nØ, n1 | CALLCA? nØ | n1 | nØ: 1 to 16<br>n1:-1 to 1Ø23<br>(-1 to 124; GSM) |
| BS-PA-MFRMS | Paging period | | MFRMS n | MFRMS? | n | n: Ø to 7; paging period=<br>n+2 [multiframe] |
| Hand Over type | | | HOTYPE INTRACELL | HOTYPE? | INTRACELL | Default is INTRACELL |
| | | | HOTYPE INTERCELL | HOTYPE? | INTERCELL | |
| Mobile Station ID | Paging IMSI | | IMSI | IMSI? | n | n:Ø to 999999999999999 |
| | | Auto | PGIMSI AUTO | PGIMSI? | AUTO | |
| | | Fix | PGIMSI FIX | PGIMSI? | FIX | |

(2) Sequence monitor command

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Mobile Station control | Start call proc. | | CALLSA | --- | --- | |
| | Stop call proc. | | CALLSO | --- | --- | |
| | Paging | | CALLPG | --- | --- | |
| | Disc. from NW | | CALLDISC | --- | --- | |
| Status | Call status | | --- | CALLSTAT? | Ø(Stop)<br>1(Idle)<br>2(Paging)<br>3(Radio Link)<br>4(Registration)<br>5(Organization)<br>6(Termination)<br>7(Communication)<br>8(Hand Over)<br>9(Disc from NW)<br>1Ø(DIsc from MS)<br>11(Radio DIsc)<br>2Ø(DUT CONTROL = NONE) | |
| | Error status | | --- | CALLERR? | nØ,n1 | nØ:Call status<br>n1<br>17:Layer1 error<br>33:Layer2 error<br>49:Layer3 error<br>5Ø:Protocol error |
| Scenario Load | File No. | | SLOAD n | SLOAD? | n | n:0 to 99 |
| | Default | | SLOAD DEFAULT | SLOAD? | DEFAULT | |
| Report & Measure result | Received IMEI | | --- | CALLIMEI? | flag*,n | |
| | Received IMSI | | --- | CALLIMSI? | flag*,n | |
| | Received NW phone No. | | --- | CALLNWNO? | flag*,n | |
| | RX level & RX quality | | --- | CALLREP? | flag*,nØ, n1 | nØ:RX level<br>n1:RX quality |
| | MS power level & timing advance | | --- | CALLPWRTA? | flag*,nØ, n1 | nØ:MS Power level<br>n1:Timing advance |
| | Time alignment | | --- | CALLTMAL? | flag*,r | |
| | Input level | | --- | CALLILVL? | flag*, ℓ | |
| | Current channel | | --- | CALLCH? | flag*,nØ, n1 | nØ:channel<br>n1:slot |
| | Adjacent cell Monitoring | | --- | CALLNCELL? | flag*,nØ, n1, n2, n3 | nØ:ARFCN<br>n1:RX Level<br>n2:Ncc<br>n3:Bcc |

flag* ..... Ø:Not receive 1:Received

| Intermediate class | Function | Function details | Program Msg | Query Msg | Response Msg | Remarks |
|---|---|---|---|---|---|---|
| Report & Measure result | Test result of each state | | ---- | CALLRSLT? n | 17: Layer1 error<br>33: Layer2 error<br>49: Layer3 error<br>5Ø: Protocol error | n=state number<br>1:Idle<br>2:Paging<br>3:Radio Link<br>4:Registration<br>5:Origination<br>6:Termination<br>7:Communication<br>8:Hand Over<br>9:Disc from NW<br>1Ø:Disc from MS<br>11:Radio Disc |
| | Clear test result of all state | | CALLRFR | ---- | | |
| Meaurement result (Multi response) | | | ---- | SEQMONMEAS? | rØ, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9 | returns all measurement results see *1 |
| | | | ---- | SEQMONMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9 | rØ, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9 | returns selected measurement results see *1 |

*1 Multi response

Query format example:

SEQMONMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9

nØ to n9:Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=10)

Actual query example:

SEQMONMEAS? 1, Ø, Ø, Ø, Ø, 1, Ø, Ø, Ø, 1

This query returns measurement results of Call status, RX level & quality and Input level

Response format:

rØ, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9

f1: Ø=Not receiver, 1=Received

rØ: Call status

r11: Call status

r12: Error status

r2: IMSI

r3: IMEI

r4: NW phone No.

r51: RX level

r52: RX quality

r6: Time alignment

r71: MS power level

r72: Timing advance

r81: Channel

r82: Slot

r9: Input level

Actual Response example: (Call status, RX level & quality and Input level)

7, 1, 23, 0, 1, -10.5

# SECTION 3
# SETUP

This section describes the RS-232C/GPIB connections to external devices and setting the remote-control interface of the MT8802A.

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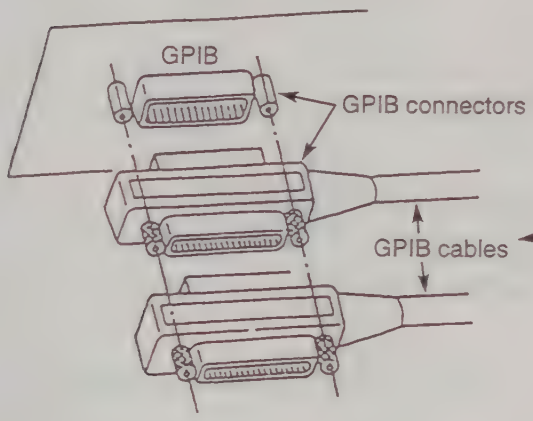
## 3.1 Connecting Devices with GPIB Cables

The rear panel has connectors for connecting GPIB cables.

Up to 15 devices, including the controller, can be connected to one system. Connect devices under the conditions described to the right of the diagram below.




Total cable length ≤20 m
Cable length between devices ≤4 m
Number of devices which can be connected ≤15

Mounting and dismounting of the GP-IB cable must be done after turning off the power switch and pulling out the power cord from the socket. If the power remains on, only signal common line may disconnected before the other lines, then AC leak voltages are applied to the ICs, and there is a possibility that components such as ICs in the interface unit will be damaged.

⚠ CAUTION

The GPIB cables must be connected before the power is turned on.

## 3.2 Setting GPIB Interface Conditions

Set the GPIB interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) GPIB: Address (Initial value: 01)

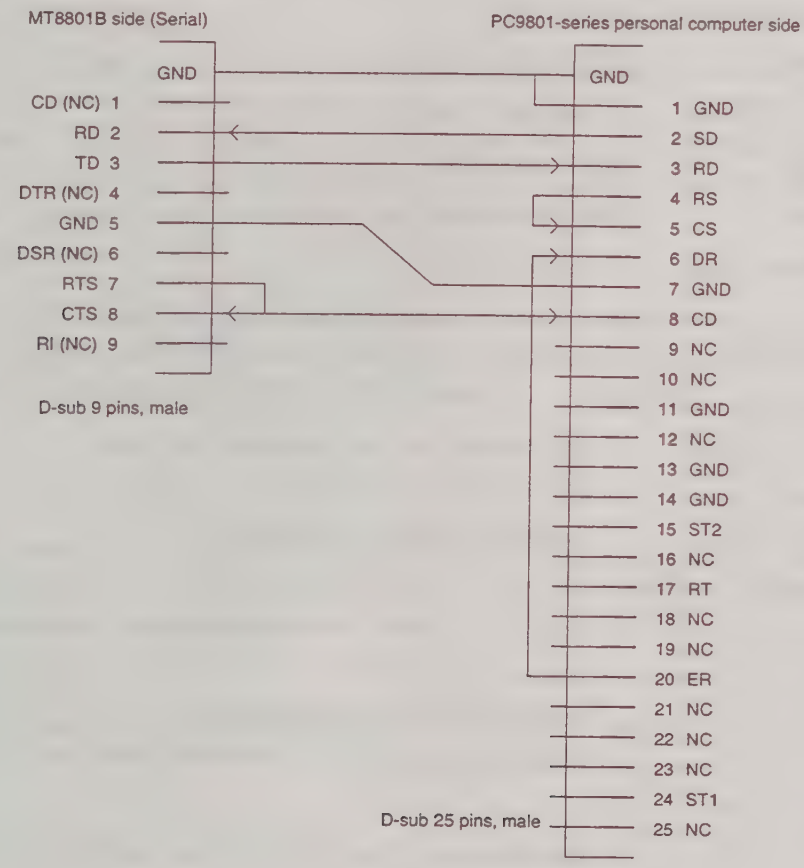
An example of the setting when the GPIB interface is set with the GPIB address03 is given below.

| Step | Key operation | Explanation |
|---|---|---|
| (Switching to the Instrument Setup screen) | | |
| 1. | [Main Func on off] F6 | Sets the Main Func on to display the main menu. |
| 2. | Next Menu[ ◀ ] | Sets the Instrument Setup mode. |
| | [Instrument Setup] F1 | Displays the Instrument Setup screen. |
| (Selecting the remote control interface) | | |
| 3. | Cursor [ ∧ ] [ ∨ ] | Uses these cursor keys to select "Interface Connect to Controller.". |
| 4. | [Set] | Opens the setup window. |
| 5. | Cursor [ ∧ ] [ ∨ ] | Selects GPIB on the setting window. |
| 6. | [Set] | Closes the setting window and determines the set value. |
| (Setting the GPIB address) | | |
| 7. | Cursor [ ∧ ] [ ∨ ] | Use these cursor keys to select a GPIB address. |
| 8. | [Set] | Opens the setup window. |
| 9. | [0] [3] [Set] | Set the GPIB address to 03. |

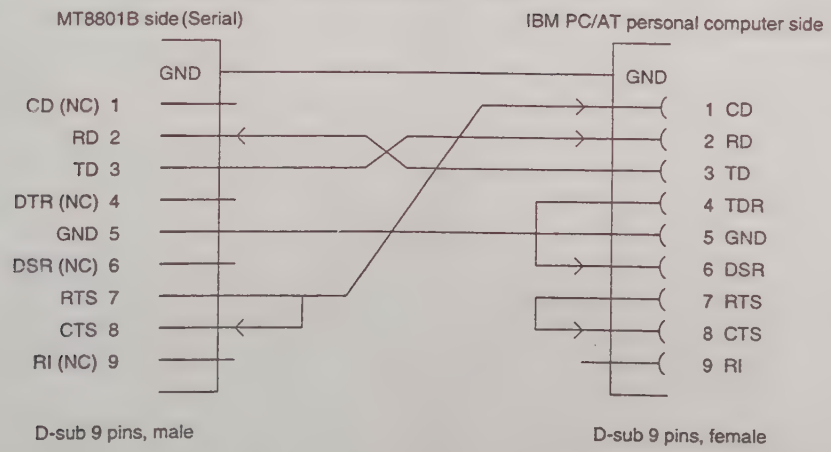
## 3.3 Connection of RS-232C Interface Signal

Connection of RS-232C interface signal between the MT8802A and a personal computer is shown below.

• Connection to PC98-series personal computer(NEC)




• Connection to IBM PC/AT personal computer



## 3.4 Setting RS-232C Interface Conditions

Set the RS-232C interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) RS-232C: Baud Rate (Initial value: 2400)

Parity (Initial value: Even)

Data Bit (Initial value: 8 bits)

Stop Bit (Initial value: 1 bit)

Set the RS-232C interface conditions, as desribed below.

| Step | Key operation | Explanation |
|---|---|---|
| (Switching to the Instrument Setup screen) | | |
| 1. | [Main Func On/Off] F6 | Sets the Main Func on to display the main menu. |
| 2. | Next Menu [ ◀ ] | Sets the Instrument Setup mode. |
| | [Instrument Setup] F1 | Displays the Instrument Setup screen. |
| (Selecting the remote control interface) | | |
| 3. | Cursor [ ∧ ] [ ∨ ] | These cursor keys are used to select "Interface Connect to Controller." |
| 4. | [Set] | Opens the setup window. |
| 5. | Cursor [ ∧ ] [ ∨ ] | Selects RS-232C on the setting window. |
| 6. | [Set] | Closes the setting window and establishes the set value. |
| (Setting the RS-232C interface) | | |
| 7. | Cursor [ ∧ ] [ ∨ ] | Uses these cursor keys to select the setting item Baud rate. |
| 8. | [Set] | Opens the setup window. |
| 9. | [ ∧ ] [ ∨ ] [Set] | Uses these cursor keys to select a Baud rate value (9600 [bps] etc.). |
| 10. | [ ∧ ] [ ∨ ] | Sets other interface conditions in the same way. |

# 3.5 Setting the Items Relating to Remote Control and Panel Key Control

## 3.5.1 Remote control and panel control keys

The keys and lamps described in this paragraph are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8802A is controlled remotely via the GPIB interface. When the MT8802A is controlled remotely from an external controller via the GPIB interface on the rear panel, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. The LOCAL key is used to cancel the remote control status of the GPIB interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an operation error on the front panel for automatic measurement or status holding. When the panel is locked, the red lamp on the PANEL LOCK key lights.

## 3.5.2 Remote control status

If the MT8802A is controlled remotely, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change from the remote control to front panel entry status, execute the following steps:

1) Halt the remote control.

2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

# SECTION 4
# DEVICE MESSAGE FORMAT

This section describes the format of the device messages transmitted between a controller and the MT8802A via the GPIB system.

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## 4.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages:program messages output from the controller to the MT8802A, and response messages input from the MT8802A by the controller. There are also two types of program commands and program queries in the program message. The program command is used to set this instrument's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

## 4.2 Program Message Format

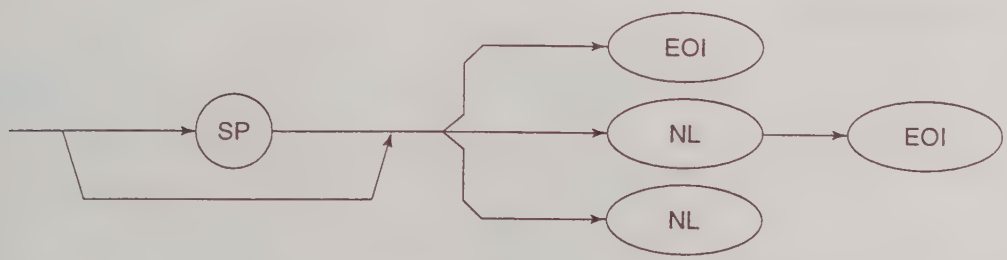
To transfer program messages from the controller to the MT8802A using the PRINT statement, the program message formats are defined as follows:

```
PRINT△@1,"TFREQ△3GHZ"
```

Program message

When the program message is transmitted from the controller to the MT8801B, the specified terminator is attached.

### (1) PROGRAM MESSAGE TERMINATOR

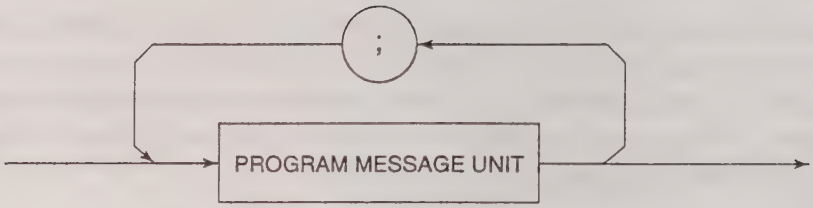



NL : New line or LF (Line Feed)

EOI : The EOI signal of the GPIB interface is used to indicate message termination.

Cartridge Return (CR) is ignored, and is not processed as a terminator.

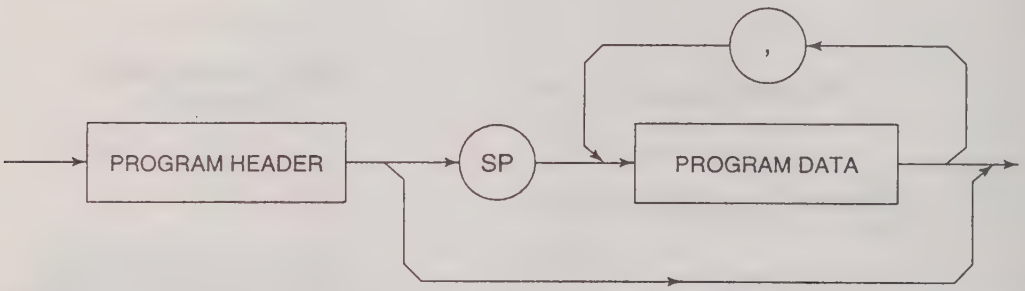
## (2) PROGRAM MESSAGE




Multiple commands can be output sequentially by concatenating each of them with a semicolon.

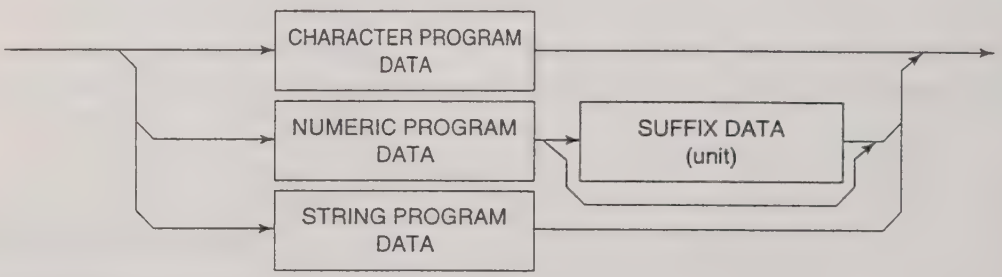
<Example> `PRINT △ @1, "TFREQ △ 1GHZ; RFLVL △ UP"`

## (3) PROGRAM MESSAGE UNIT




- Each IEEE488.2 common command has a leading asterisk "*" that is always placed before the program header.
- The program query has a trailing question mark "?" that is always added at the end of the program header.

## (4) PROGRAM DATA




## (5) CHARACTER PROGRAM DATA

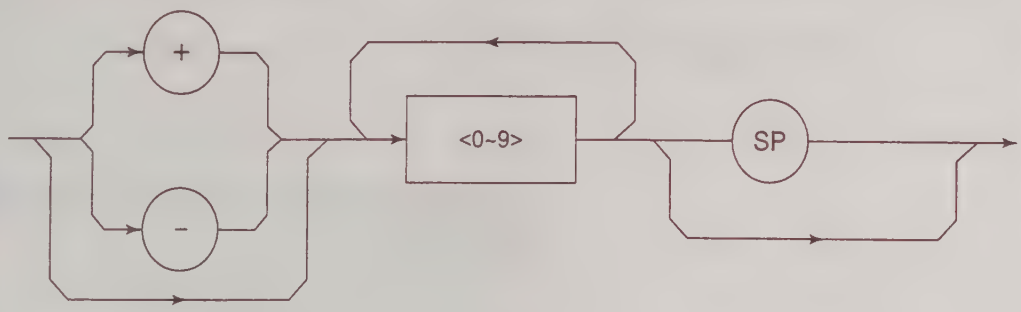
Character program data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9. These characters can be used in specified combinations.

<Example> `PRINT △ @1, △ "MKR △ NRM"` . . . . . Sets Marker to Normal.

## (6) NUMERIC PROGRAM DATA

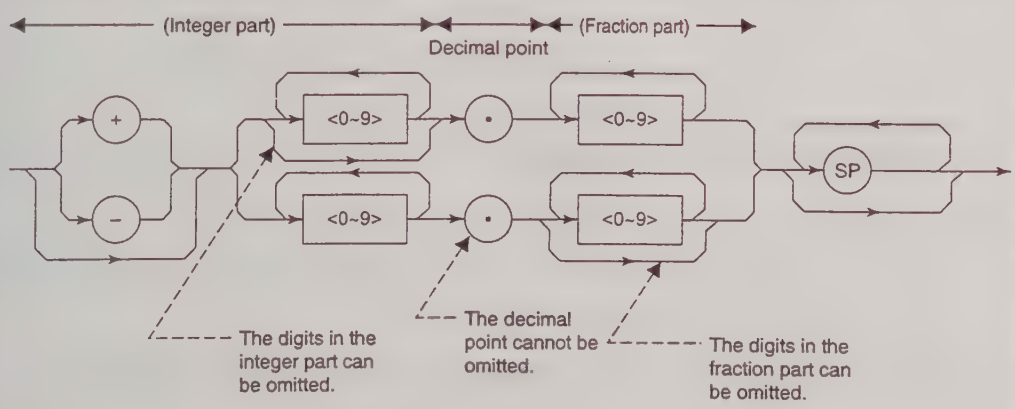
Numeric program data has two types of formats:integer format (NR1) and fixed-point real number format (NR2).

<Integer Format (NR1)>



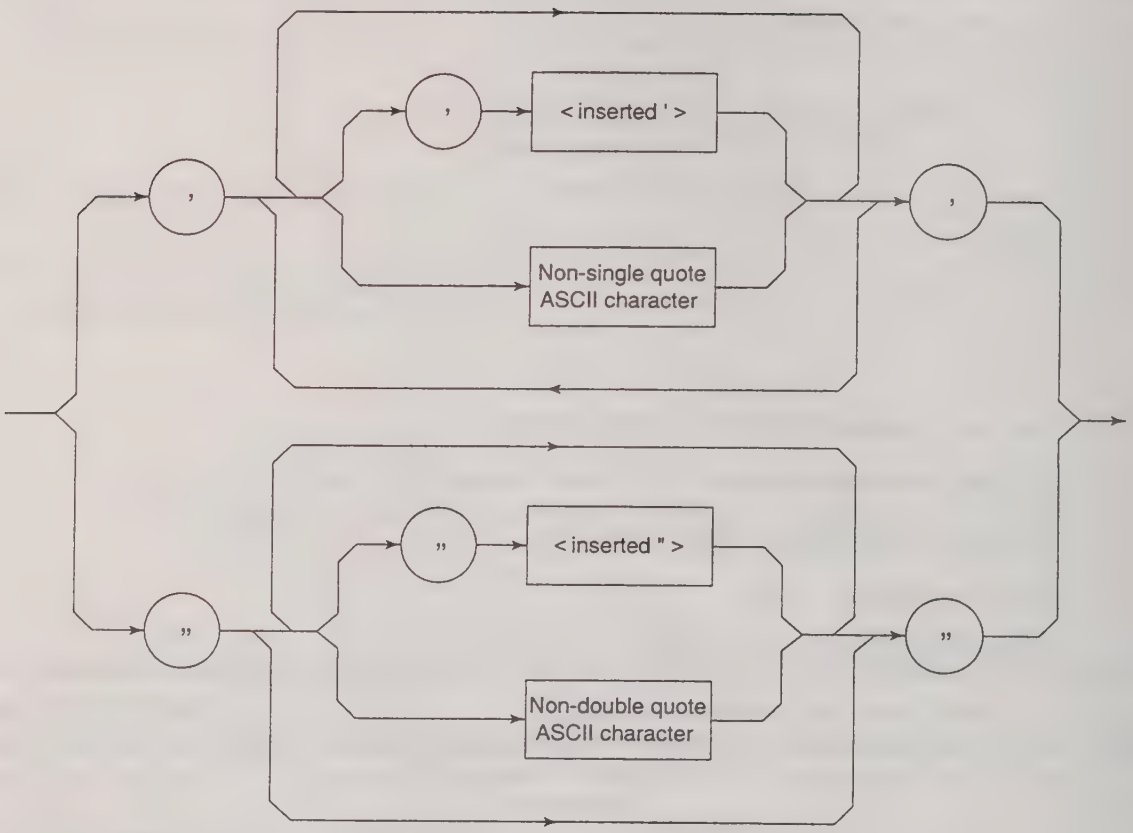

- Zeros can be inserted at the beginning. → 005, +000045
- No spaces can be inserted between a + or - sign and a number. → 5, +△5 (×)
- Spaces can be inserted after a number. → +5△△△
- The + sign is optional. → +5,5
- Commas cannot be used to separate digits. → 1,234,567 (×)

<Fixed-Point (real number) Format (NR2)>




- The numeric expression of the integer format is applied to the integer part.
- No spaces can be inserted between numbers and the decimal point. → +753△.123 (×)
- Spaces can be inserted between numbers and the decimal point. → +753.123△△△△
- A number may not always be placed before the decimal point. → .05
- A + or - sign can be placed before the decimal point. → +. 05, –.05
- A number can end with a decimal point. → 12.

## (7) STRING PROGRAM DATA




•Both ends of string program data must have a pair of double quotation marks "___".

```
PRINT @1,"TITLE 'MT8802A'"
```

A single quotation mark used within the character string must be repeated as shown in ' or ".

```
PRINT @1,"TITLE 'MT8802A''NOISE MEAS''' "
```

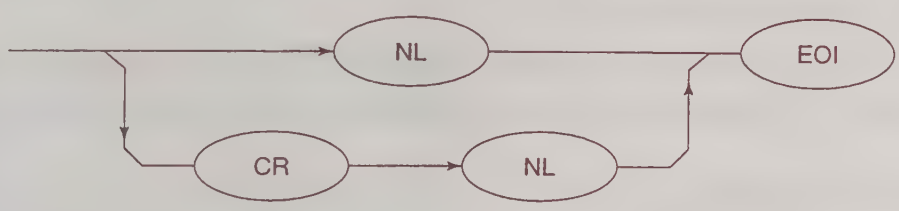
Executing TITLE results in MT8802A 'NOISE MEAS'.

Note: To use the double quotation mark " in the PRINT statement, specify CHR$ (&H22).

## 4.3 Response Message Format

To transfer responses messages from the MT8802A to the controller by using the INPUT statement, the response message formats are defined as follows:

### (1) RESPONSE MESSAGE TERMINATOR

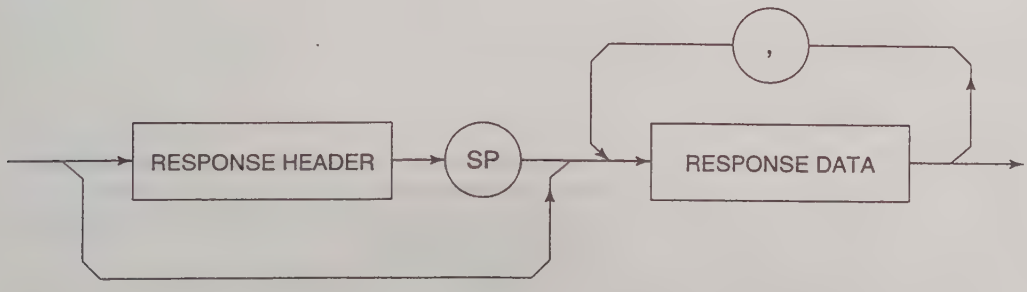



The response message terminator to be used depends on the TRM command.

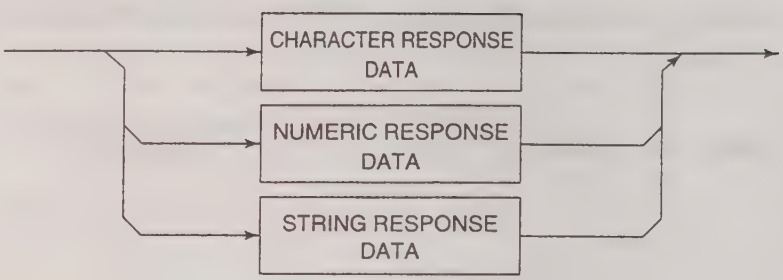
### (2) RESPONSE MESSAGE

When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

### (3) Normal RESPONSE MESSAGE UNIT



## (4) RESPONSE DATA

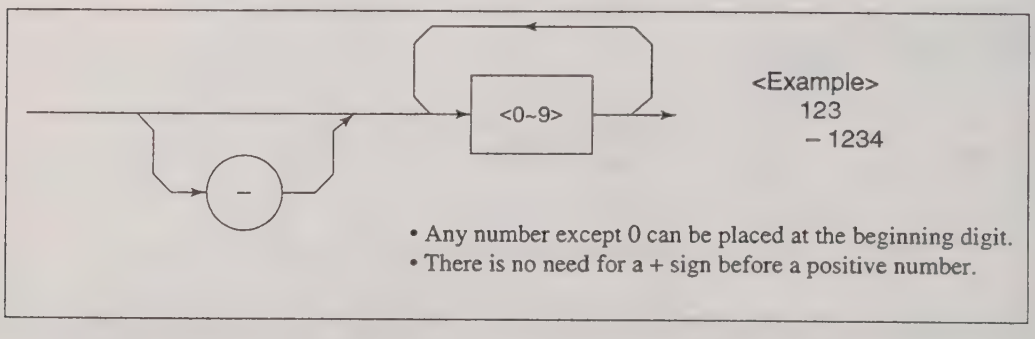



## (5) CHARACTER RESPONSE DATA

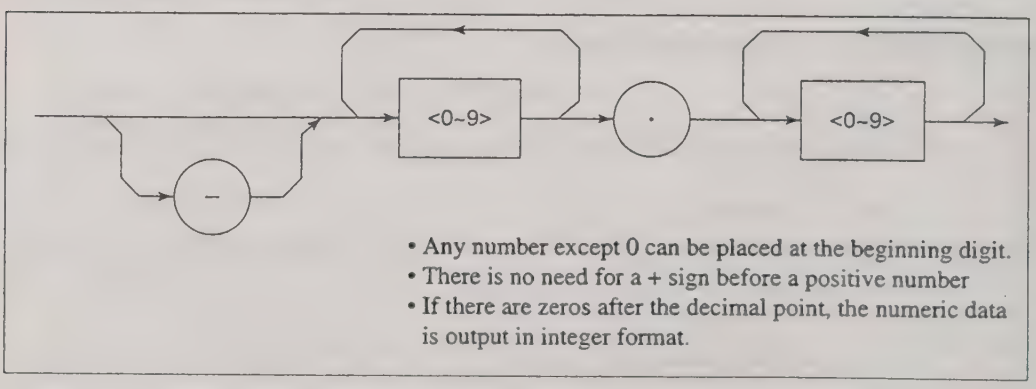
Character response data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9.These characters can be used in specified combinations.

## (6) NUMERIC RESPONSE DATA

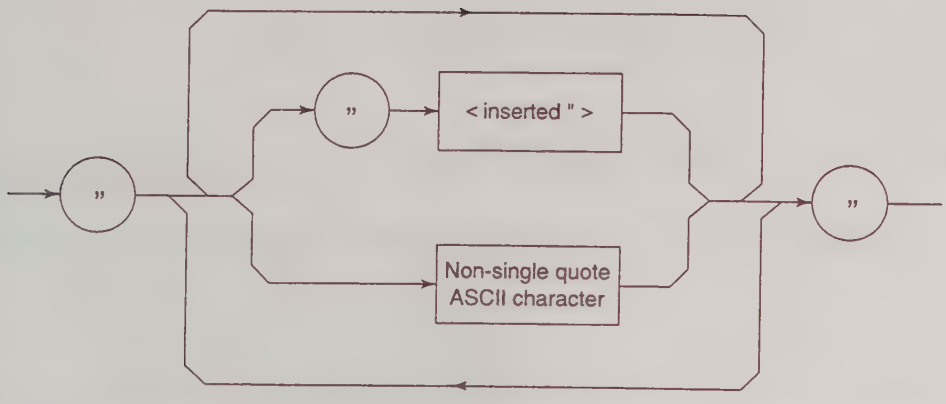
<Integer Format (NR1)>




<Integer Format (NR1)>


<0~9>
.
<0~9>
–
• Any number except 0 can be placed at the beginning digit.
• There is no need for a + sign before a positive number
• If there are zeros after the decimal point, the numeric data is output in integer format.

## (7) STRING RESPONSE DATA




String response data is output as an ASCII character string, which is enclosed with double quotation marks.

## (8) Response message to input the waveform data using binary data

For details on reading binary format, see paragraph 8.2.2 (4) in Section 8, "SAMPLE PROGRAMS. "

# SECTION 5
# STATUS MESSAGES

This section describes MT8802A status messages, their data structure and models, and explains the techniques for synchronizing the controller and the MT8802A.

To obtain more detailed status information, the IEEE488.2 standard has more common commands and common queries than the IEEE488.1 standard.

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The Status Byte (STB) sent to the controller is based on the IEEE488.1 standard. The bits comprising it are called a status summary message because they represent a summary of the current data contained in registers and queues.

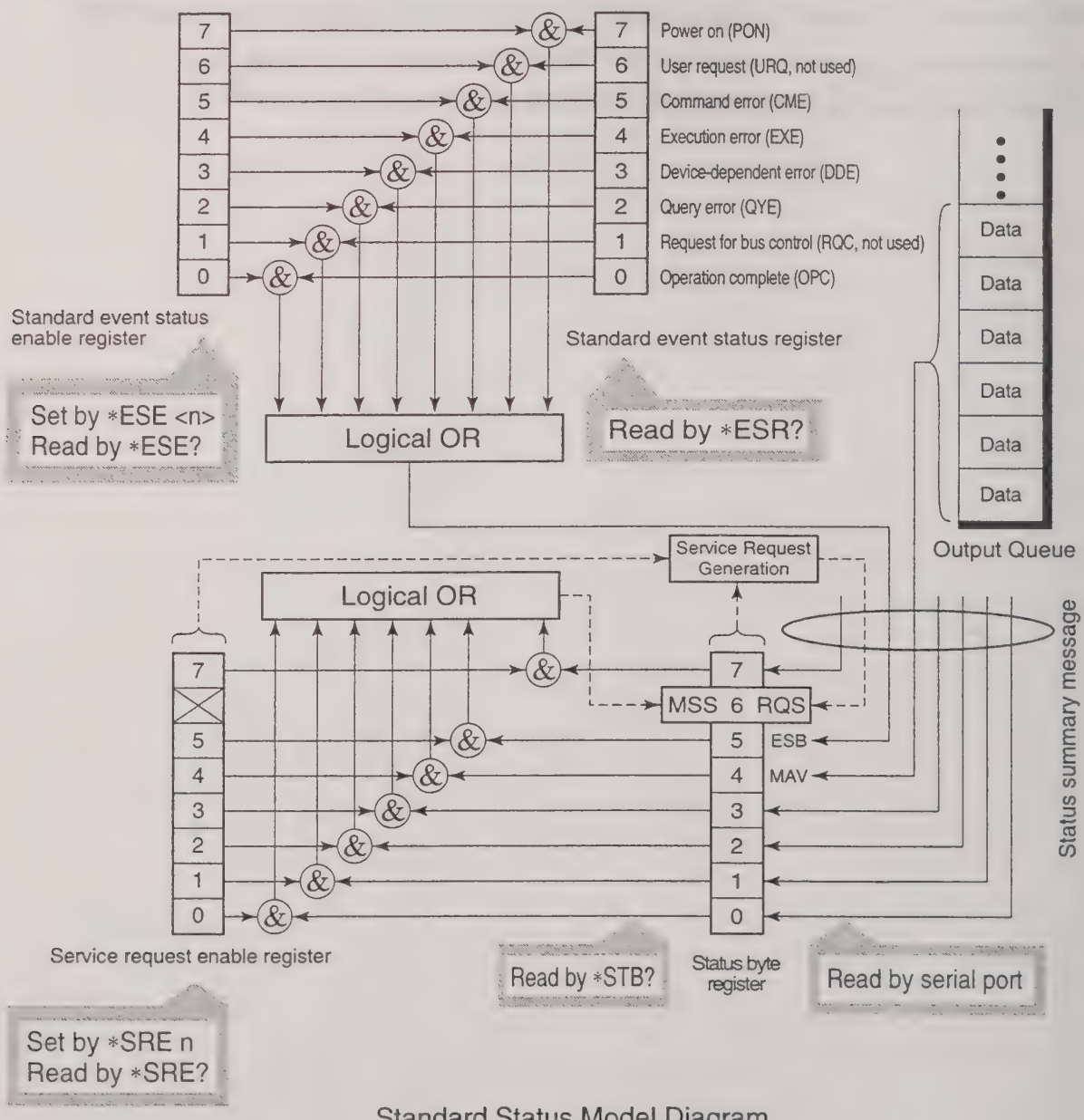
The following pages explain the status summary message and structure of status data that constitutes the status summary message bits, as well as techniques for synchronizing the MT8802A and controller, which use these status messages.

These functions are used by an external controller with the GPIB interface bus.

Almost functions can be used by an external controller with the RS-232C interface.

## 5.1 IEEE488.2 Standard Status Model

The diagram below shows the standard model for the status data structure stipulated in the IEEE488.2 standard.




Standard Status Model Diagram

The IEEE488.1 status byte is used in the status model. This status byte is composed of seven summary message bits given from the status data structure. To create the summary message bits, there are two models for the data structure:the register model and the queue model.

| Register model | Queue model |
|---|---|
| The register model consists of the two registers used for recording events and conditions encountered by a device. These two registers are the Event Status Register and Event Status Enable Register. When the result of the AND operation of both register contents is not 0, the corresponding bit of the status bit becomes 1.In other cases, it becomes 0.And, when the result of their Logical OR is 1, the summary message bit also becomes 1.If the logical OR result is 0, the summary message bit also becomes 0. | The queue in the queue model is for sequentially recording the waiting status values and data. The queue structure is such that the relevant bit is set to 1 when there is data in it and 0 when it is empty. |

In IEEE488.2, there are three standard models for status data structure, two register models and one queue model, based on the register model and queue model explained above. They are:

1 Standard Event Status Register and Standard Event Status Enable Register
2 Status Byte Register and Service Request Enable Register
3 Output Queue

| Standard Event Status Register | Status Byte Register | Output Queue |
|---|---|---|
| The Standard Event Status Register has the structure of the previously described register model. In this register, bits are set for eight types of standard events encountered by a device. 1 Power on, 2 User request, 3 Command error, 4 Execution error, 5 Device-dependent error, 6 Query error, 7 Request for bus control and 8 Operation complete. The logical OR output bit is represented by Status Byte Register bit 5 (DIO6) as a summary message for the Event Status Bit (ESB). | The Status Byte Register is a register in which the RQS bit and the seven summary message bits from the status data structure can be set. It is used together with the Service Request Enable Register. When the result of the OR operation of both register contents is not 0, SRQ goes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit, which indicates a service request for the external controller. The mechanism of SRQ conforms to the IEEE488.1 standard. | The Output Queue has the structure of the queue model mentioned above. Status Byte Register bit 4 (DIO5) is set as a summary message for Message Available (MAV) to indicate that there is data in the output buffer. |

## 5.2 Status Byte (STB) Register

The STB register consists of device STB and RQS (or MSS) messages. The IEEE488.1 standard defines the method of reporting STB and RQS messages, but not the setting and clearing of protocols or the meaning of STB. The IEEE488.2 standard defines the device status summary message and the Master Summary Status (MSS) which is sent to bit 6 together with STB in response to an *STB? common query.

### 5.2.1 ESB and MAV summary messages

The following describes the ESB and MAV summary messages.

#### (1) ESB summary messages

The ESB (Event Summary Bit) summary message is a message defined by IEEE488.2, and is represented by bit 5 of the STB register. This bit indicates whether at least one of the events defined in IEEE488.2 has occurred when the service request enable register is set to enable events after the final reading or clearing of the standard event register.

The ESB summary message bit becomes 1 when the setting permits events to occur if any of the events recorded in the standard event status register becomes 1.The ESB summary bit becomes true when the setting permits events to occur if any of the events registered in the standard event status register is true. Conversely, it is false if none of the recorded events occurs even if events are set to occur.

This bit becomes FALSE (0) when the ESR register is read by the *ESR? query and the ESR register is cleared by the *CLS command.

#### (2) MAV summary messages

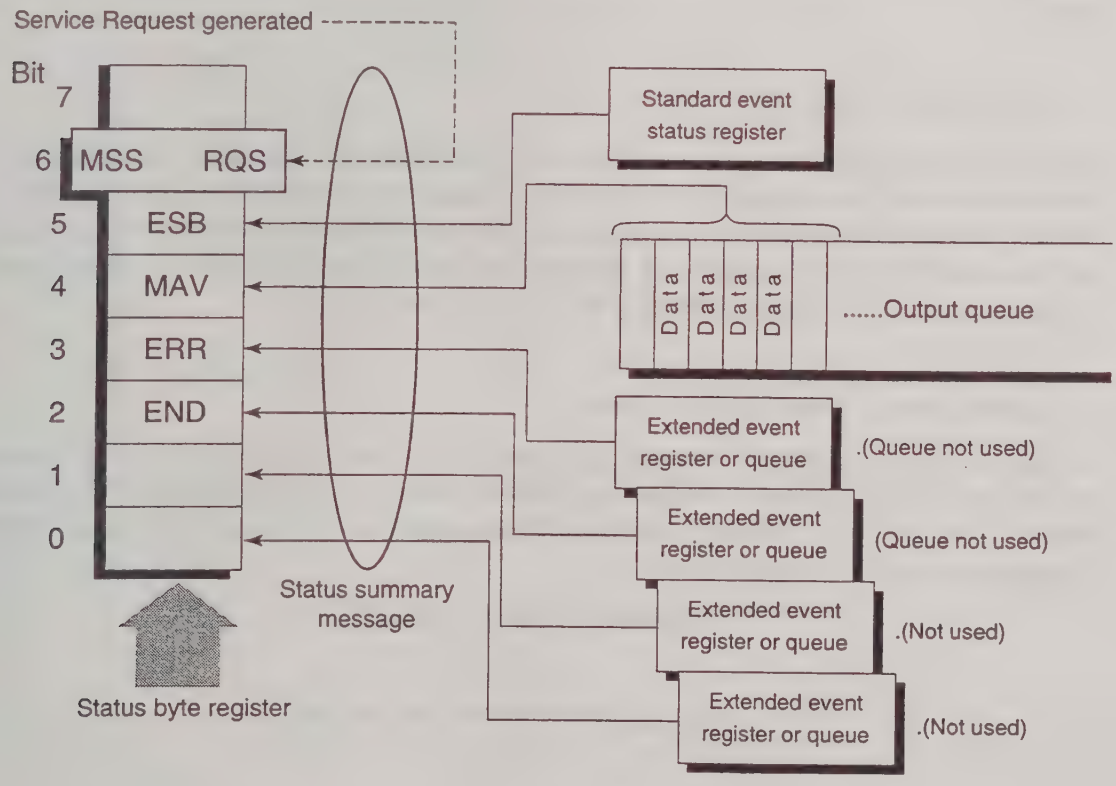
The MAV summary message is a message defined in IEEE488.2 and represented by bit 4 in the STB register. This bit indicates whether the output queue is empty. The MAV summary message bit is set to 1 (true) when a device is ready to receive a request for a response message from the controller and to 0 (false) when the output queue is empty. This message is used to synchronize the exchange of information with the controller. For example, this message can be used to make the controller wait until MAV is true after it sends a query command to the device. While the controller is waiting for a response from thedevice, it can process other jobs. Reading the output queue without first checking MAV delay all system bus operations until the device responds.

## 5.2.2 Device-dependent summary messages

The IEEE488.2 standard specifies that bits 7 (DIO8) and 3 (DIO4) to 0 (DIO1) of the status byte register can be used as status register summary bits, or to indicate that there is data in a queue.

Device-dependent summary messages have the respective status data structures of the register model or the queue model. Thus, the status data structure may be either the register to report events and status in parallel or the queue to report conditions and status in sequence. The summary bit represents a summary of the current status of the corresponding status data structure. For the register model, the summary message is true when there is an event set to permit the occurrence of more than one true event; while for the queue model, it is true if the queue is not empty.

As shown below, the MT8802A does not use bits 0, 1 and 7. As it uses bits 2 and 3 as the summary bit of the status register, it has 3 register model types (where 2 types are extended) and one queue model type(with no extension).



### 5.2.3 Reading and clearing the STB register

Serial poll or the *STB? common query are used to read the contents of the STB register. STB messages conforming to IEEE488.1 can be read by either method, but the value sent to bit 6 (position) is different for each message.
The STB register can be cleared by using the *CLS command.

#### (1) Reading by serial poll (only when using the GPIB interface)

When using serial poll conforming to IEEE488.1, the device must return a 7-bit status byte and an RQS message bit which conforms to IEEE488.1.According to IEEE488.1, the RQS message indicates whether the device sent SRQ as true or not. The value of the status byte is not changed by serial poll. The device must set the RQS message to false immediately after being polled. As a result, if the device is again polled before there is a new cause for a service request, the RQS message is false.

#### (2) Reading by the *STB common query

The *STB? common query requires the device to send the contents of the STB register and an integer format response message from the MSS (Master Summary Status) summary message. The response represents the total binary weighted value of the STB register and the MSS summary message. STB register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32, and 128; and the MSS to 64, respectively. Thus, excepting the fact that bit 6 represents the MSS summary message instead of the RQS message, the response to *STB? is identical to that for serial poll.

#### (3) Definition of MSS (Master Summary Status)

MSS indicates that there is at least one cause for a service request. The MSS message is represented by bit 6 in a device response to the *STB? query, but it is not generated response to serial poll. In addition, it is not part of the status byte specified by IEEE488.1.MSS is generated by the logical OR operation of the STB register with SRQ enable (SRE) register. In concrete terms, MSS is defined as follows:

(STB Register bit0 AND SRE Register bit0)

OR

(STB Register bit1 AND SRE Register bit1)

OR

:

:

(STB Register bit5 AND SRE Register bit5)

OR

(STB Register bit7 AND SRE Register bit7)

Since bit-6 status of the STB and SR enable registers is ignored in the definition of MSS, it can be considered that bit-6 status is always being 0 when calculating the value of MSS.

### (4) Clearing the STB register by the *CLS common command

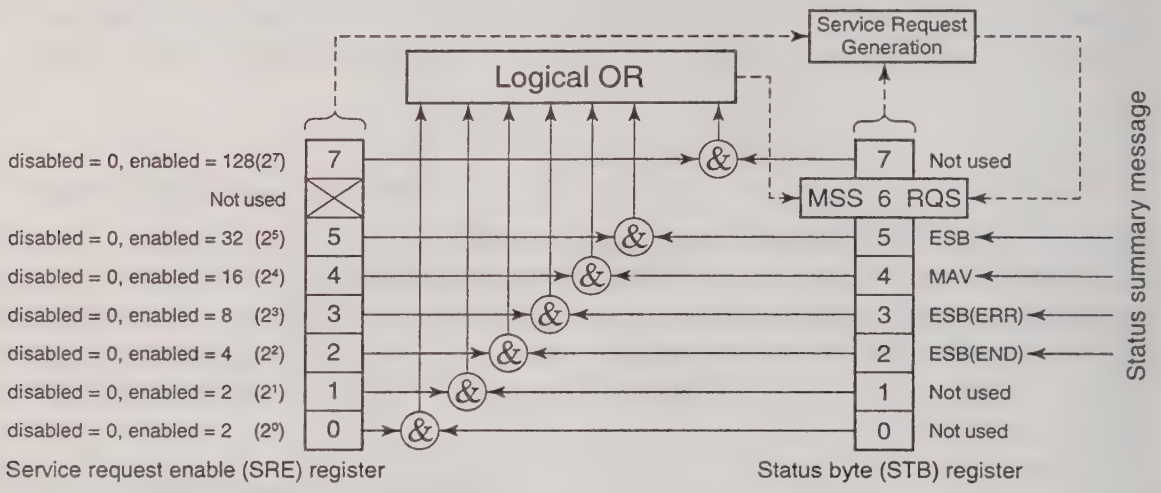
With the exception of the output queue and its MAV summary message, the *CLS common command clears all status data structures (status event registers and queues) as well as the corresponding summary messages.

The *CLS command does not affect settings in the enable registers.

## 5.3 Enabling the Service Request (SRQ)

All types of summary messages in the STB register can be enabled or disabled for service requests (SRE) by using the program-controlling service request (SRQ) enable operation. The service request enable (SRE) register controls the generation of SRQ in bits 0 to 7 as shown in the diagram below.

Bits in the service request enable register correspond to bits in the status byte register. If a bit in the status byte corresponding to an enabled bit in the service request enable register is set to 1, the device makes a service request to the controller with the RQS bit set to 1.For example, if bit 4 in the service request enable register is enabled, the device makes a request for service to the controller each time the MAV bit is set to 1 when there is data in the output queue.




### (1) Reading the SRE register

The contents of the SRE register are read using the *SRE? common query. The response message to this query is an integer from 0 to 255, which is the sum of the bit digit weighted values in the SRE register. SRE register bits 0 to 5 and 7 are respectively weighted to 1, 2, 4, 8, 16, 32, and 128.The unused bit 6 must always be set to 0.

### (2) Updating the SRE register

The *SRE common instruction is used to write data to the SRE register. An integer from 0 to 255 is added after the *SRE. fm3common instruction.

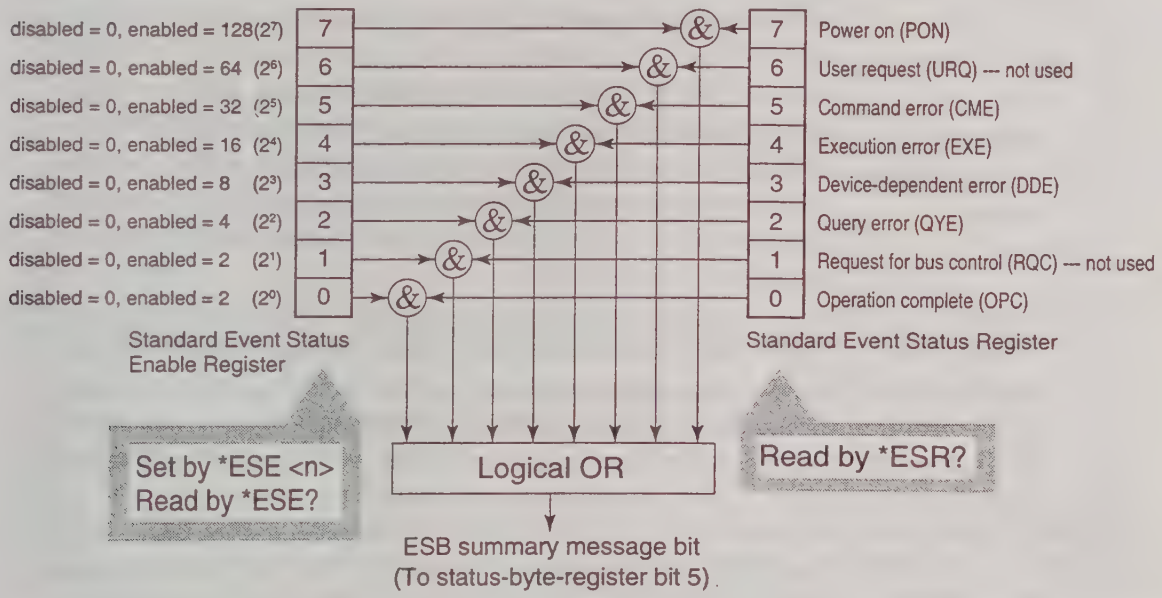
This integer indicates the total number of bits in the SRE register (weighted values:1, 2, 4, 8, 16, 32, and 128), and sets the corresponding SRE register bit to 0 or 1.

A bit value of 1 indicates an enabled state; 0 indicates a disabled state. Always ignore the value of bit 6.

## 5.4 Standard Event Status Register

### 5.4.1 Bit definition of standard event status register

The standard event status register must be available on all devices conforming to the IEEE488.2 standard. The diagram below shows the operation of the standard event status register model. Because the operation of the model is the same as that for the other models already described, the following only explains the meaning of each bit in the standard event status register as defined in the IEEE488.2 standard.




Standard event status enable (ESE) register selects whether the register makes the summary message true when the corresponding bit of the event status register is set.

| Bit | Event name | Description |
|---|---|---|
| 7 | Power on (PON) | The power is turned on. |
| 6 | User Request (URQ) | Request for local control (rtl).<br>This bit is produced regardless of whether a device is in remote or local mode. It is not used for the MT8802A so, it is always set to 0. |
| 5 | Command Error (CME) | An illegal program message, a misspelt command or a GET command within a program is received. |
| 4 | Execution error (EXE) | A legal program message, which cannot be executed, is received. |
| 3 | Device-dependent Error (DDE) | An error caused by other than CME, EXE or QYE (e.g., parameter error) occurred. |
| 2 | Query Error (QYE) | An attempt is made to read data in the output queue though there is none there, or data is lost from the output queue due to some reason (e.g., overflow). |
| 1 | Request Control (RQC) | A device is requesting an active controller.This bit is not used for the MT8802A so, it is always set to 0. |
| 0 | Operation Complete (OPC) | A device has completed specified operations and is ready to receive new commands. This bit is only set in response to the *OPC command. |

## 5.4.2 Query error details

| No. | Item | Description |
|---|---|---|
| 1 | Incomplete program message | If a device receives an MTA from the controller before it receives the terminator of the program message it is receiving, it aborts the incomplete program message and waits for the next one. To abort the incomplete message, the device clears its input-output buffer, reports a query error to the status report section and sets bit 2 in the standard status register to indicate the query error. |
| 2 | Interruption of response message output | If a device receives an MLA from the controller before it has sent the terminator of the response message it is sending, it automatically interrupts response message output and waits for the next program. To interrupt the response message output, the device clears its output buffer, reports a query error to the status report section, and sets bit 2 in the standard status register to indicate the query error. |
| 3 | Sending the next program message without reading the previous response message | When a device becomes unable to send a response message because the controller has sent another program message immediately following a program or query message, the device aborts the response message and waits for the next program message. It then reports a query error to the status report section as in No.2 above. |
| 4 | Output queue overflow | When several program and query messages are executed in succession, too many response messages for the output queue (256 bytes) may be generated. If further query messages are received when the output queue is full, the output queue cannot send corresponding responses due to the overflow situation. If there is overflow in the output queue, the device clears it and resets the section where response messages are created. Then it sets bit 2 in the standard event status register to indicate a query error. |

### 5.4.3 Reading, writing to and clearing the standard event status register

| | |
|---|---|
| Reading | The register is read by the *ESR? common query.<br>The register is cleared after being read. The response message is an integer format data value obtained by binary weighting the event bit and converting it to a decimal number. |
| Writing | With the exception of clearing, writing operations cannot be performed externally. |
| Clearing | The register is only cleared in the following cases:<br>1 A *CLS command received.<br>2 The power is turned on.<br>Devices first clear their standard event status registers but later record events that occurred during the sequence in the registers (e.g., setting of the PON event bit).<br>3 An event is read for the *ESR? command. |

### 5.4.4 Reading, writing to and clearing the standard event status enable register

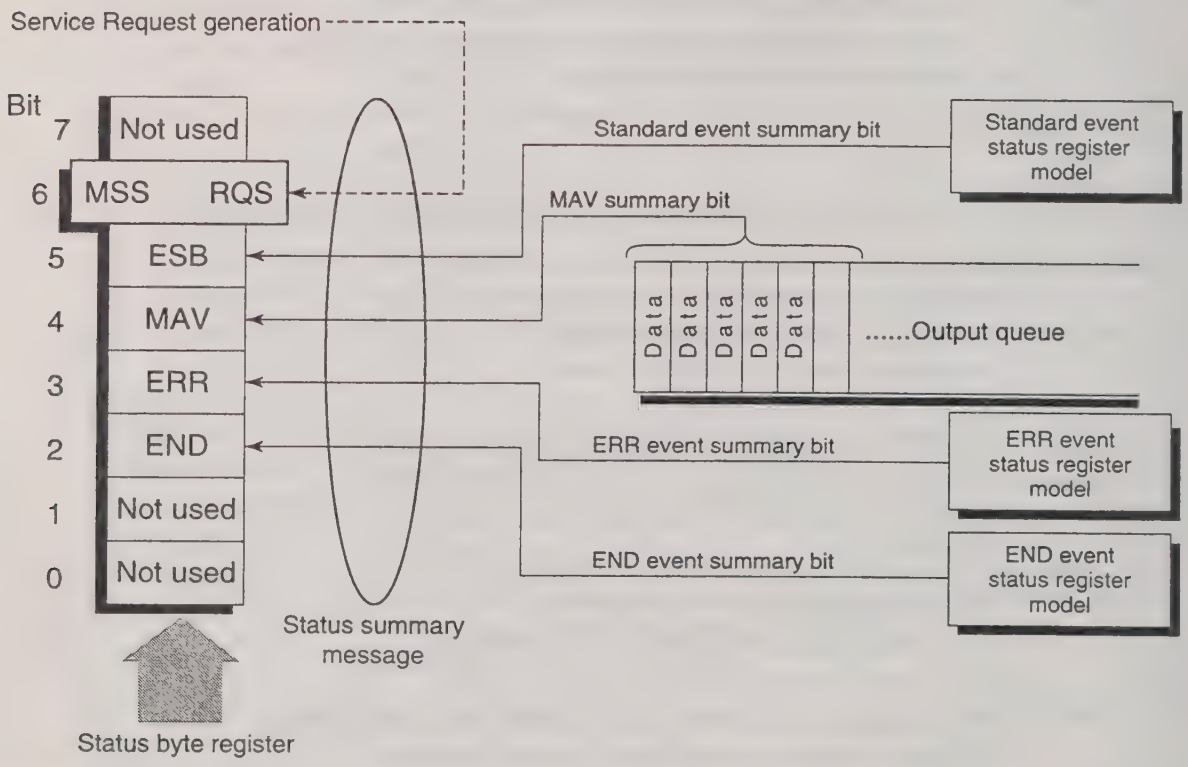
| | |
|---|---|
| Reading | The register is read by the *ESE? common query.<br>The response message is an integer format data value obtained by binary weighting the event bit and converting to a decimal number. |
| Writing | The register is written to by the *ESE common command. As bits 0 to 7 of the register are respectively weighted to 1, 2, 4, 8, 16, 32, 64, and 128, data to be written is sent by <DECIMAL NUMERIC PROGRAM DATA> which is the digit total of the bits selected from these bits. |
| Clearing | The register is cleared in the following cases:<br>1 An *ESE command with a data value of 0 is received.<br>2 The power is turned on.<br>The standard event status enable register is not affected by the following:<br>1 Changes of the status of the IEEE488.1 device clear function<br>2 An *RST common command is received.<br>3 A *CLS common command is received. |

## 5.5 Extended Event Status Register

The register models of the status byte register, standard event status register and enable registers are mandatory for equipment conforming to the IEEE488.2 standard.

In IEEE488.2, status-byte-register bits 7 (DIO8), 3 (DIO4) to 0 (DIO1) are assigned to status summary bits supplied by the extended-register and extended-queue models.

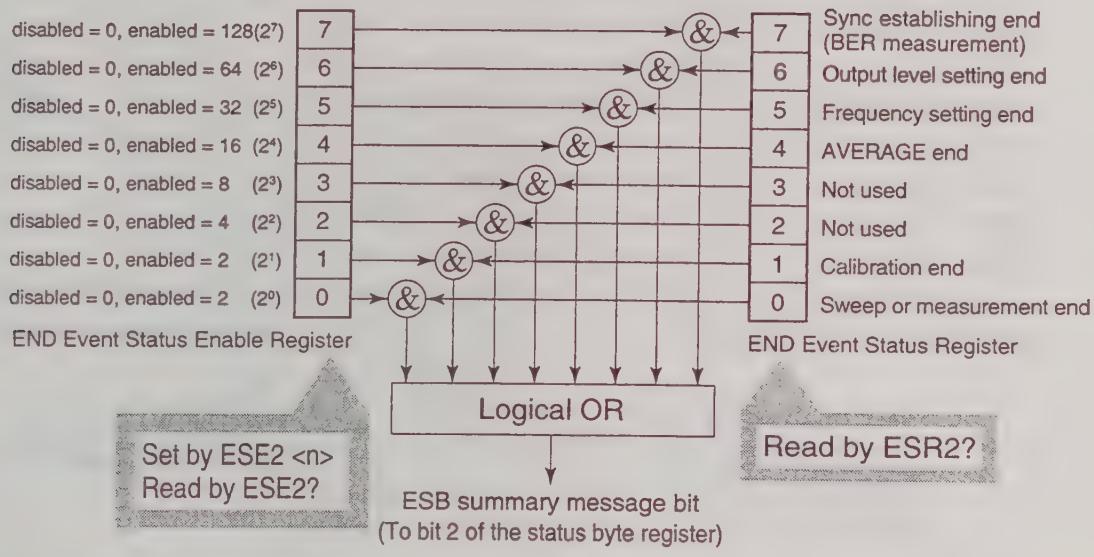
For the MT8802A, as shown in the diagram below, bits 7, 1 and 0 are unused; bits 2 and 3 are assigned to the END and ERR summary bits as the status-summary bits supplied by the extended-register model. As the queue model is not extended, there is only one type of queue: the output queue.




The following pages describe bit definition, the reading, writing to and clearing of bits for the END extended event register model.

## 5.5.1 Bit definition of END event status register

The following describes the operation of the END event status register model, the naming of its event bits, and what they mean.

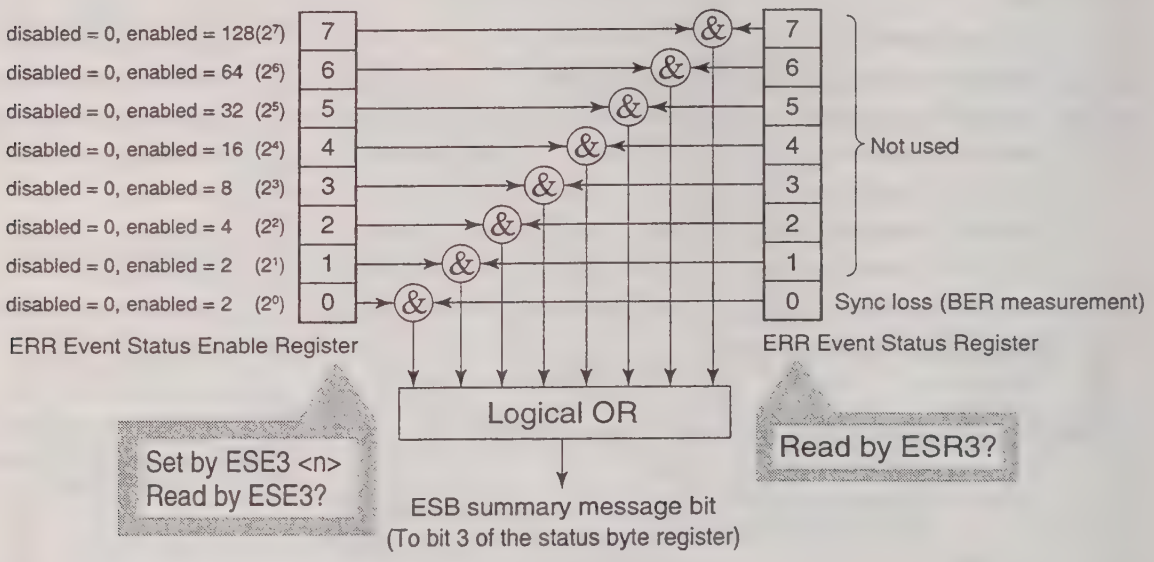



The END event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

| Bit | Event name | Description |
|---|---|---|
| 7 | Sync establishing end | This bit is set to 1 when synchronization is established after BER measurement starts. |
| 6 | Output level setting end | This bit is set to 1 when output level setting ends. |
| 5 | Frequency setting end | This bit is set to 1 when frequency setting ends. |
| 4 | AVERAGE end | This bit is set to 1 when averaging ends. |
| 3 | (Not used) | (Not used) |
| 2 | (Not used) | (Not used) |
| 1 | CAL end | This bit is set to 1 when calibration ends. |
| 0 | Sweep or measurement end | This bit is set to 1 when sweep or measurement ends. |

## 5.5.2 Bit definition of ERR event status register

The following describes the operation of the ERR event status register model, the naming of its event bits, and what they mean.




The ERR event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

| Bit | Event name | Description |
|---|---|---|
| 7 | (Not used) | (Not used) |
| 6 | (Not used) | (Not used) |
| 5 | (Not used) | (Not used) |
| 4 | (Not used) | (Not used) |
| 3 | (Not used) | (Not used) |
| 2 | (Not used) | (Not used) |
| 1 | (Not used) | (Not used) |
| 0 | Sync loss | This bit is set to 1 when synchronization loss is occurred. |

### 5.5.3 Reading, writing to and clearing the extended event status register

| | |
|---|---|
| Reading | The register is destructively read by a query (e.g., it cleared after being read).<br>The END/ERR event status register is read by ESR2?/ESR3? query. The read value, an integer format data (NR1), is obtained by binary weighting the event bit and converting it to decimal. |
| Writing | With the exception of clearing, writing operations cannot be performed externally. |
| Clearing | The register is cleared in the following cases:<br>1 A *CLS command is received.<br>2 The power is turned on.<br>3 An event is read by the ESR2?/ESR3? query command. |

### 5.5.4 Reading, writing to and clearing the extended event status enable register

| | |
|---|---|
| Reading | The register is non-destructively read by a query (i.e., not cleared after being read).<br>The END/ERR event status register is read by the ESE2?/ESE3? query.<br>The read value, an integer format data (NR2), is obtained by binary total weighting the event bit and converting it to decimal. |
| Writing | The END/ERR event status register is written to by the ESE2/ESE3 program command. As bits 0 to 7 of the registers are respectively binary weighted to 1, 2, 4, 8, 16, 32, 64, and 128, write data is sent as the integer format data obtained by total weighting the digit value of bits selected from among them. |
| Clearing | The register is cleared in the following cases:<br>1 The ESE2/ESE3 program command with a data value of 0 is received for the END/ERR event status register.<br>2 The power is turned on the power-on-status-clear flag is true.<br>The extended event status enable register is not affected by the following:<br>3 Changes of the status of the IEEE488.1 device clear function<br>4 An *RST common command is received.<br>5 A *CLS common command is received. |

## 5.6 Techniques for Synchronizing the MT8802A with a Controller

The MT8802A usually treats program messages as sequential commands that do not execute the processing of newly received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between the MT8802A and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MT8802A have been processed, the next commands must be sent to other devices.

There are five ways of synchronizing the MT8802A with the controller:

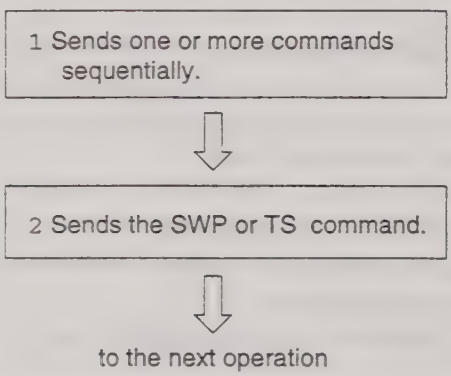
1 Wait for SWP or TS command termination.
2 Wait for a response after the *OPC? query is sent.
3 Wait for SRQ after *OPC is sent.
4 Wait for status generation of the status register.
5 Wait for SRQ by the status register.

### 5.6.1 Wait for SWP or TS command termination

When the MT8802A starts measurement using the SWP or TS command, it stops accepting the next measurement command until it terminates the measurement. Use this feature to set a synchronization.

Note: A response may not be returned if there is no measurement termination condition (permanent measurement of BER, etc.). In Average measurement mode, a response may be returned before averaging.

<Controller program>

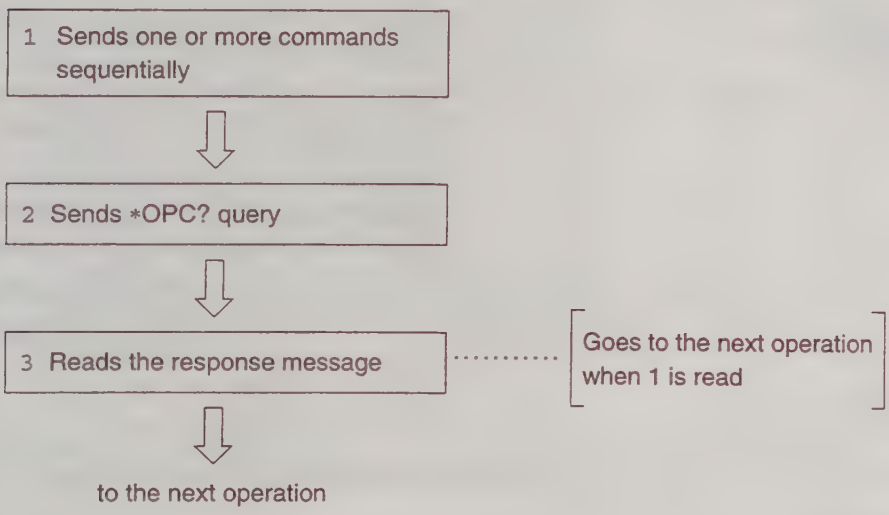


## 5.6.2 Wait for response after *OPC? query is sent

When executing the *OPC? query command, the MT8802A outputs "1" as the response message at the end of the previous command. The controller is synchronized with the MT8802A by waiting for the request message to be entered.

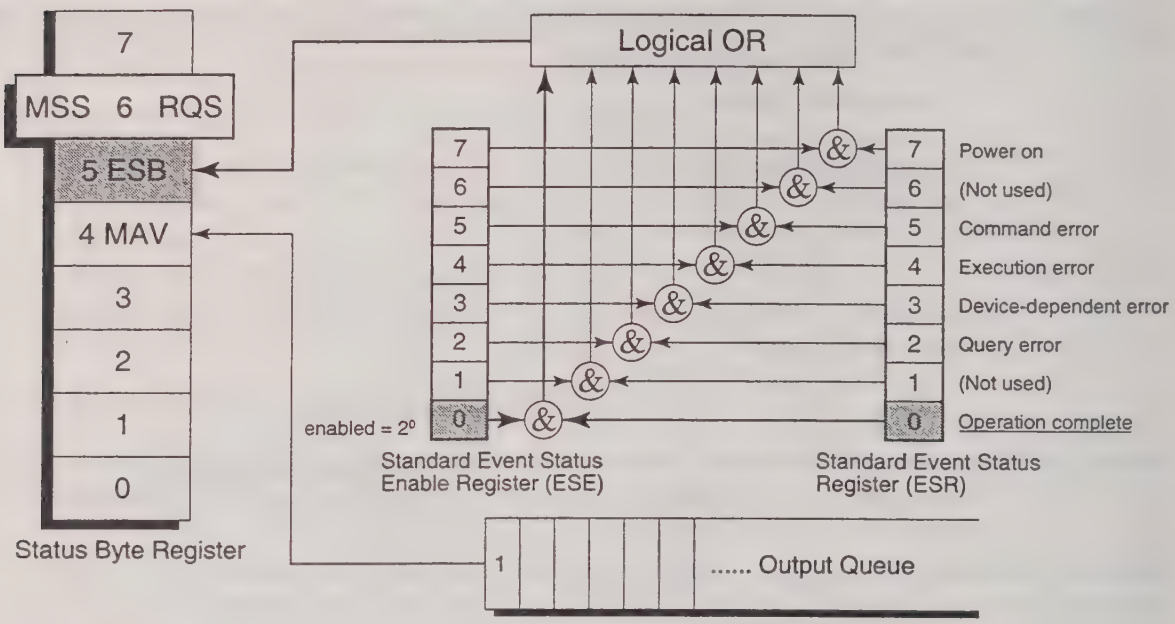
Note: When the read response message is "Q" (command is being executed), wait for about 50 ms until the controller moves to the next operation.

<Controller program>


1 Sends one or more commands sequentially
2 Sends *OPC? query
3 Reads the response message
Goes to the next operation when 1 is read
to the next operation

## 5.6.3 Wait for service request after *OPC is sent

The MT8802A sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MT8802A by waiting for SRQ when the operation-complete bit is set for SRQ.




• <Controller program>

1 Enables the 20 bit (1) of the Standard Event Status Enable Register — `PRINT△@1;"*ESE△1"`

2 Enables the 25 bit (32) of the Service Request Enable Register — `PRINT△@1;"*SRE△32"`

3 Makes the device execute the specified operation

4 Sends the *OPC command — `PRINT△@1;"*OPC"`

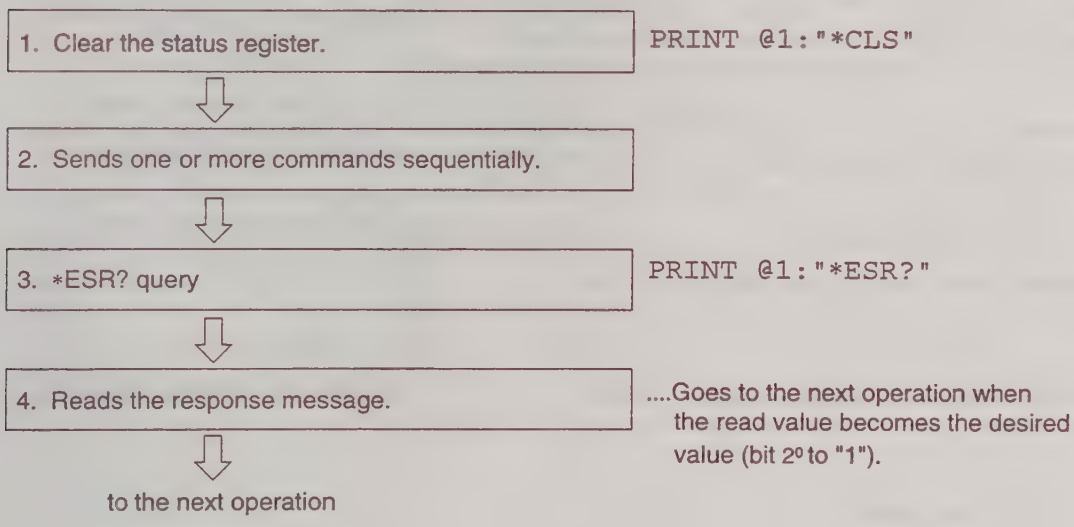
5 Wait for an SRQ interrupt (ESB summary message) ....Value of status byte: $2^6 + 2^5 = 96$

## 5.6.4 Wait for status generation of the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs.When the *ESR?, ESR2?, or ESR3? query is executed, the MT8802A outputs the value of the corresponding status register as a response message. The controller reads this response message and waits until the response becomes the specified value for synchronization.Reset the event status register immediately before making a desired event occur.

Note: Wait for 50 ms for the controller to go to the next operation after reading a response message.

• <Controller program : Synchronization by operation termination bit>


1. Clear the status register.
PRINT @1:"*CLS"
2. Sends one or more commands sequentially.
3. *ESR? query
PRINT @1:"*ESR?"
4. Reads the response message.
....Goes to the next operation when the read value becomes the desired value (bit 2⁰ to "1").
to the next operation

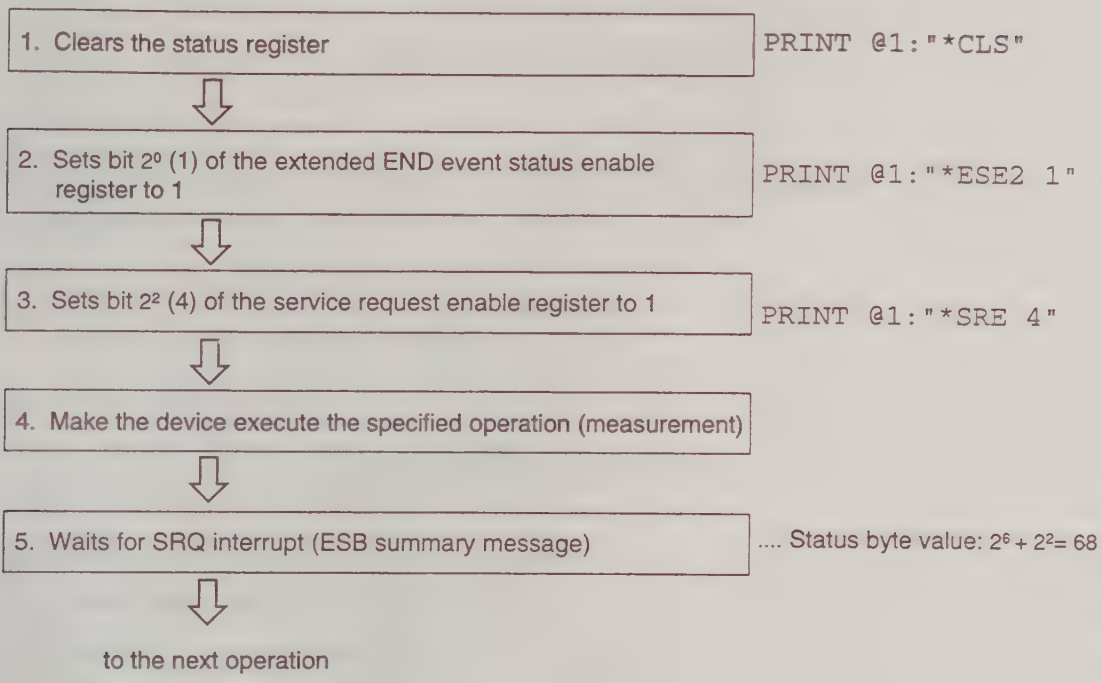
## 5.6.5 Wait for service request issuance from the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs. After setting these bits to set the RQS, the controller waits the SRQ for synchronization. Reset the event status register immediately before making a desired event occur.

• <Controller program 1: Synchronization by operation termination bit>

| | |
|---|---|
| 1. Clears the status register. | `PRINT @1:"*CLS"` |
| ⇩ | |
| 2. Sets bit $2^0$ of the standard event status enable register to 1. | `PRINT @1:"*ESE 1"` |
| ⇩ | |
| 3. Sets bit $2^5$ (32) of the service request enable register to 1. | `PRINT @1:"*SRE 32"` |
| ⇩ | |
| 4. Makes the device execute the specified operation. | |
| ⇩ | |
| 5. Waits for SRQ interrupt (ESB summary message). | ....Status byte value: $2^6 + 2^5 = 96$ |
| ⇩ | |
| to the next operation | |

• <Controller program 2: Synchronization by the sweep/measurement termination bit>


1. Clears the status register
PRINT @1:"*CLS"
2. Sets bit 2⁰ (1) of the extended END event status enable register to 1
PRINT @1:"*ESE2 1"
3. Sets bit 2² (4) of the service request enable register to 1
PRINT @1:"*SRE 4"
4. Make the device execute the specified operation (measurement)
5. Waits for SRQ interrupt (ESB summary message)
.... Status byte value: 2⁶ + 2²= 68
to the next operation

# SECTION 6
# INITIAL SETTINGS

This section outlines initialization for the system and describes how to initialize the system.
An example of initial settings are written for IBM-PC commands.

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## 6.1 General Description

There are three levels of initialization for the GPIB system.

The first level is bus initialization using the IFC statement with the system bus in the idle state.

The second level is initialization for message exchange using the DCL command to enable devices to receive program messages.

The third level is device initialization using the PRE or *RST command to initialize device functions. These levels of initialization prepare a device for operation.

A device must be set to a known state when the power is switched on.

| Level | Initialization type | Description | Level combination and sequence |
|---|---|---|---|
| 1 | Bus initialization | The IFC message from the controller initializes all interface functions connected to the bus. | Can be combined with other levels, level 1 must be executed before level 2. |
| 2 | Initialization for message exchange | The message exchanges of all devices and specified devices on the GPIB are initialized respectively by the DCL (Device Clear) and SDC (Select Device Clear) GPIB bus commands, which also nullify the function that reports to the controller that operation has completed. | Can be combined with other levels, level 2 must be executed before level 3. |
| 3 | Device initialization | The *RST or PRE/INI/IP command returns the specified device to the device-dependent known state, regardless of the conditions of previous device use. | Can be combined with other levels; level 3 must be executed after levels 1 and 2. |

The following paragraph describes the commands for executing levels 1, 2, and 3, and the items initialized by execution. It also describes the known state which is set when the power is switched on.

When controlling with an external controller through the GPIB interface bus, all the initialization functions of the first/second/third levels can be used.

When controlling with an external controller through the RS-232C interface port, the initialization function of the third level (device initialization) can be used. The initialization functions of the first/second levels cannot be used.

## 6.2 Bus Initialization by the IFC Statement

■ Example

```
ISETΔIFC
```

■ Explanation

IThe IFC statement initializes the interface functions of all devices connected to the GPIB bus line.

The initialization of interface functions involves erasing the settings (e.g. talker, listener) made by the controller and resetting to the initial states. In the table below, O indicates the initialized functions; Δ indicates partially initialized functions.

| No | Function | Symbol | Initialization by IFC |
|---|---|---|---|
| 1 | Source handshake | SH | ○ |
| 2 | Acceptor handshake | AH | ○ |
| 3 | Talker or extended talker | T or TE | ○ |
| 4 | Listener or extended listener | L or LT | ○ |
| 5 | Service request | SR | Δ |
| 6 | Remote/local | RL | |
| 7 | Parallel poll | PP | |
| 8 | Device clear | DC | |
| 9 | Device trigger | DT | |
| 10 | Controller | C | ○ |

Bus initialization by the IFC statement does not affect the device-operating state (e.g. frequency settings, lamp on/off).

## 6.3 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

| | |
|---|---|
| `WBYTEΔ&H3F,Δ&H14;` | Initializes all devices under the bus for message exchange (sending DCL) |
| `WBYTEΔ&HE3F,Δ&H04,Δ&H23;` | Initializes only the device whose address is 3 for message exchange (sending SDC) |

■ Explanation

This statement executes initialization for message exchange by all devices or only the specified device on the GPIB of the specified select code.

■ Items to be initialized for message exchange

The MT8802A by which the DCL or SDC bus command is accepted executes the following:

1 Input buffer and Output Queue: Cleared; the MAV bit is also cleared at the same time.

2 Parser, Execution Controller, and Response Formatter: Reset

3 Device commands including *RST: Clears all commands that prevent these commands from executing.

4 Processing the *OPC command: Puts a device in OCIS (Operation Complete Command Idle State). As a result, the operation complete bit cannot be set in the Standard Event Status Register.

5 Processing the *OPC query: Puts a device in OQIS (Operation Complete Query Idle State). As a result, the operation complete bit 1 cannot be set in the Output Queue.

6 Device function: Puts sections relating to message exchange in an idle state. The device keeps waiting for a message from a controller.

Note: The items listed below are not affected even if DCL and SDC bus command processing is executed:

(1) The current data set or stored in the device

(2) Front panel settings

(3) Other status byte state except MAV bit

(4) Device operation in progress

## 6.4 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

`PRINT @1,"*RST"`: Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The *RST(Reset) command is an IEEE488.2 common command which resets a device with level 3.

The *RST(Reset) command is used to reset a device (MT8802A) to a specific initial state. Refer to the separate Operation Manual Vol. 1 Appendix B for details of initialization items and initial values.

Note: The *RST command does not affect the items listed below.

(1) IEEE488.1 interface state
(2) Device address
(3) Output Queue
(4) Service Request Enable register
(5) Standard Event Status Enable register
(6) Power-on-status-clear flag setting
(7) Calibration data affecting device specifications
(8) Parameters preset for controlling external devices, etc.

## 6.5 Device Initialization by the PRE/INI/IP Command

■ Syntax

```
PRE
INI
IP
```

■ Example (program message)

`PRINT @1,"PRE"`: Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The PRE, INI and IP commands are MT8802A device-dependent messages which initialize a device with level 3.

Refer to the separate Operation Manual Vol. 1 Appendix B for details of items initialized by the PRE, INI, and IP commands and initial values.

## 6.6 Device Status at Power-on

When the power is switched on:

1 Preset value: When a power-off time (POWERON LAST) is selected, the device is set to the status before the last power off.

  Preset value: When Recall memory No. (POWERON n) is selected, the device is set to file (number [n]) status.

2 The Input Buffer and Output Queue are cleared.

3 The Parser, Execution Controller, and Response Formatter are initialized.

4 The device is put into OCIS (Operation Complete Command Idle State).

5 The device is put into OQIS (Operation Complete Query Idle State).

6 The Standard Event Status and Standard Event Status Enable Registers are cleared. Events can be recorded after the registers have been cleared.

For the special case of 1 , when the power supply is first turned on after the device is shipped, the initial values are set to those in the initial setting table (refer to separate Operation Manual Vol. 1 Appendix B).

# SECTION 7
# WAVEFORM DATA STORAGE FORMAT

This section describes the storage format of waveform data fetched by an external computer. The use examples are described in the IBM-PC instructions.

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(3) XMN (magnitude error measurement waveform of modulation analysis) ..... 7-6

(4) XMP (phase error measurement waveform of modulation analysis) ..... 7-7

## 7.1 Notes on Fetching the Waveform Data

### (1) Fetching screen

- The waveform data to be fetched must be displayed on the MT8802A screen.
- Check that the measurement terminates before fetching the waveform data. If Continuous measurement mode is set or measurement does not terminate, the correct data cannot be fetched.

Examples of checking measurement termination:

a) In Continuous measurement mode

1. Switch to Single measurement mode.

2. Read the End Event Status Register (ESR2) and check that the measurement terminates.

b) In Average measurement mode

- Read the End Event Status Register (ESR2) and check that both averaging and measurement terminate.

c) In Single measurement mode

- Read the End Event Status Register (ESR2) and check that the measurement terminates.

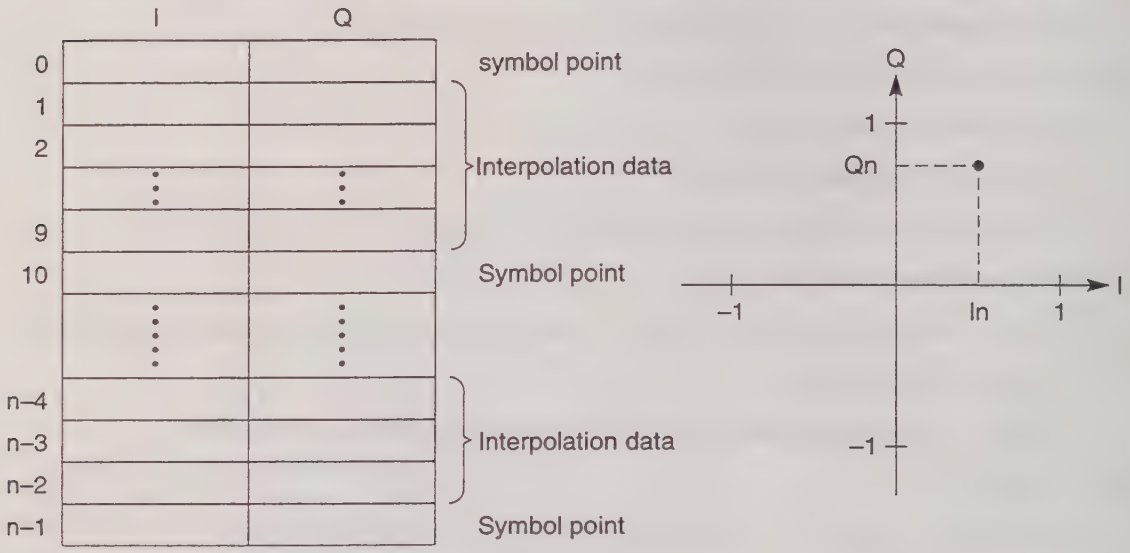
### (2) Response data

- When fetching two or more data items together, commas (,) are output as data separators.
- The query command format is designed so that it can fetch all data items together. However, the number of data items actually fetched depends on restrictions placed on the external controller.

## 7.2 Waveform Data Storage Format

(1) XMC (constellation measurement waveform of modulation analysis)

a) Format




- Stored with the two-dimensional I-Q data.
- n depends on the measuring system (GSM:1470).
- Correspondence to screen display is as follows (INTERPOLATION mode)

  NON: Dots represent symbol points (0,10,...,n).

  LINEAR: A symbol point is enclosed in a linear line frame (0-10, -...-n)

  10POINT: Dotted lines connect a symbol point and interpolation data (0-1-2-...-n)

b) Range

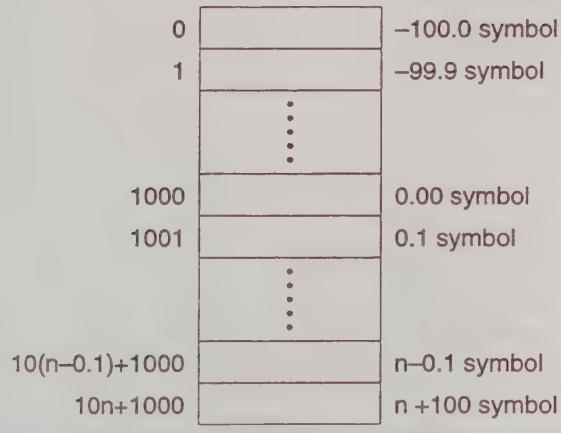
- Displays an integer value in 0.0001 units (ideal signal 1 = 10000).

c) Use examples

```
Call ibwrt(ud%,"XMC?Δ Ø,Ø,1")
Call ibrd(ud%,rdbuf$)
IØ=Val(rdbuf$)
Call ibwrt(ud%, "XMC?Δ 1,Ø,1")
Call ibrd(ud%,rdbuf$)
QØ=Val(rdbuf$)
```

(2) XMD (RF power measurement waveform)

a) Format




- n depends on the measuring system (GSM:1250).
- Correspondence to the horizontal axis scale of screen display (RF POWER screen) is on a one-to-one ratio.

b) Range

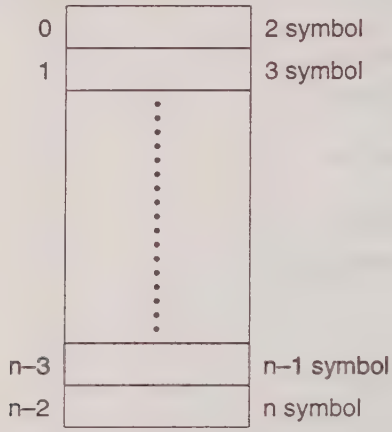
- Displays an integer value in 0.01 dBm units (1 dBm = 100).

c) Use examples

```
Call ibwrt(ud%, "XMD?Δ48Ø,1")
Call ibrd(ud%, rdbuf$)
LVL=Val(rdbuf$)
```

(3) XMN (magnitude error measurement waveform of modulation analysis)

a) Format




- n depends on the measurement system and the Measuring Object.
  For GSM MS-NB:147
- Correspondence to the horizontal axis scale of screen display (Magnitude error screen) is on a one-to-one ratio.

b) Range

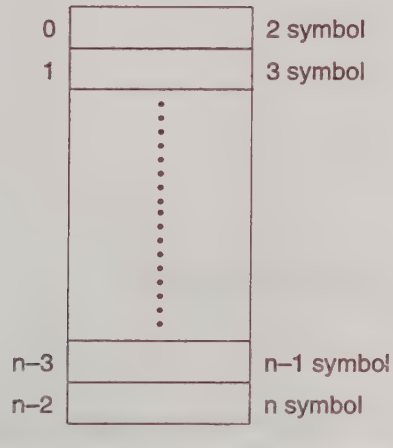
- An integer in 0.01% units represents the range (magnitude error = 1%).

c) Use examples

```
Call ibwrt(ud%, "XMN?Δ1ØØ,1")
Call ibrd(ud%, rdbuf$)
LVL=Val(rdbuf$)
```

(4) XMP (phase error measurement waveform of modulation analysis)

a) Format




- n depends on the measurement system and the Measuring Object.
  For GSM MS-NB:147
- Correspondence to the horizontal axis scale of screen display (Phase error screen) is on a one-to-one ratio.

b) Range

- An integer in a 0.01 degree unit represents the range (phase error of 1 degree: 100).

c) Use examples

```
Call ibwrt(ud%, "XMP?Δ1ØØ,1")
Call ibrd(ud%, rdbuf$)
LVL=Val(rdbuf$)
```

# APPENDIXES

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Appendix-II.

# APPENDIX A ASCII* CODE TABLE

| B7 B6 B5 / BITS B4 B3 B2 B1 | 0 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1 0 0 | 1 0 1 | 1 1 0 | 1 1 1 |
|---|---|---|---|---|---|---|---|---|
| | CONTROL | | NUMBERS SYMBOLS | | UPPER CASE | | LOWER CASE | |
| 0 0 0 0 | 0 NUL 0 | 20 DLE 16 | 40 SP 32 | 60 0 48 | 100 @ 64 | 120 P 80 | 140 ` 96 | 160 p 112 |
| 0 0 0 1 | 1 GTL SOH 1 | 21 LLO DC1 17 | 41 ! 33 | 61 1 49 | 101 A 65 | 121 Q 81 | 141 a 97 | 161 q 113 |
| 0 0 1 0 | 2 NUL 2 | 22 DC2 18 | 42 " 34 | 62 2 50 | 102 B 66 | 122 R 82 | 142 b 98 | 162 r 114 |
| 0 0 1 1 | 3 ETX 3 | 23 DC3 19 | 43 # 35 | 63 3 51 | 103 C 67 | 123 S 83 | 143 c 99 | 163 s 115 |
| 0 1 0 0 | 4 SDC EOT 4 | 24 DCL DC4 20 | 44 S 36 | 64 4 52 | 104 D 68 | 124 T 84 | 144 d 100 | 164 t 116 |
| 0 1 0 1 | 5 PPC ENO 5 | 25 PPU NAK 21 | 45 % 37 | 65 5 53 | 105 E 69 | 125 U 85 | 145 e 101 | 165 u 117 |
| 0 1 1 0 | 6 ACK 6 | 26 SYN 22 | 46 & 38 | 66 6 54 | 106 F 70 | 126 V 86 | 146 f 102 | 166 v 118 |
| 0 1 1 1 | 7 BEL 7 | 27 ETB 23 | 47 ' 39 | 67 7 55 | 107 G 71 | 127 W 87 | 147 g 103 | 167 w 119 |
| 1 0 0 0 | 10 GET BS 8 | 30 SPE CAN 24 | 50 ( 40 | 70 8 56 | 110 H 72 | 130 X 88 | 150 h 104 | 170 x 120 |
| 1 0 0 1 | 11 TCT HT 9 | 31 SPD EM 25 | 51 ) 41 | 71 9 57 | 111 I 73 | 131 Y 89 | 151 i 105 | 171 y 121 |
| 1 0 1 0 | 12 LF A 10 | 32 SUB 26 | 52 * 42 | 72 : 58 | 112 J 74 | 132 Z 90 | 152 j 106 | 172 z 122 |
| 1 0 1 1 | 13 VT B 11 | 33 ESC 27 | 53 + 43 | 73 ; 59 | 113 K 75 | 133 [ 91 | 153 k 107 | 173 { 123 |
| 1 1 0 0 | 14 FF C 12 | 34 FS 28 | 54 , 44 | 74 < 60 | 114 L 76 | 134 \ 92 | 154 l 108 | 174 \| 124 |
| 1 1 0 1 | 15 CR D 13 | 35 GS 29 | 55 - 45 | 75 = 61 | 115 M 77 | 135 ] 93 | 155 m 109 | 175 } 125 |
| 1 1 1 0 | 16 SO E 14 | 36 RS 30 | 56 . 46 | 76 > 62 | 116 N 78 | 136 ^ 94 | 156 n 110 | 176 ~ 126 |
| 1 1 1 1 | 17 SI F 15 | 37 US 31 | 57 / 47 | 77 ? 63 | 117 O 79 | 137 UNT _ 95 | 157 o 111 | 177 RUBOUT (DEL) 7F 127 |
| | Address command | Universal command | Listen address | | Talk address | | Secondary address or command | |

KEY octal / hex: 25 PPU / NAK / 15 21 — GPIB code, ASCII character, decimal

*American Standard Code for Information Interchange

# Table A-1 GPIB Interface Messages (Extended)

| b7 → | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b6 → | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| b5 → | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Bits b4 ↓ | b3 ↓ | b2 ↓ | b1 ↓ | COLUMN → / ROW ↓ | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| 0 | 0 | 0 | 0 | 0 | NUL | | DLE | | SP | Listener address (MLA) assigned to equipment | 0 | Listener address (MLA) assigned to equipment | @ | Listener address (MLA) assigned to equipment | P | Listener address (MLA) assigned to equipment | ` | Meaning defined by PCG | p | Meaning defined by PCG |
| 0 | 0 | 0 | 1 | 1 | SOH | GTL | DC1 | LLO | ! | | 1 | | A | | Q | | a | | q | |
| 0 | 0 | 1 | 0 | 2 | STX | | DC2 | | " | | 2 | | B | | R | | b | | r | |
| 0 | 0 | 1 | 1 | 3 | ETX | | DC3 | | # | | 3 | | C | | S | | c | | s | |
| 0 | 1 | 0 | 0 | 4 | EOT | SDC | DC4 | DCL | $ | | 4 | | D | | T | | d | | t | |
| 0 | 1 | 0 | 1 | 5 | ENQ | PPC | NAK | PPU | % | | 5 | | E | | U | | e | | u | |
| 0 | 1 | 1 | 0 | 6 | ACK | | SYN | | & | | 6 | | F | | V | | f | | v | |
| 0 | 1 | 1 | 1 | 7 | BEL | | ETB | | ' | | 7 | | G | | W | | g | | w | |
| 1 | 0 | 0 | 0 | 8 | BS | GET | CAN | SPE | ( | | 8 | | H | | X | | h | | x | |
| 1 | 0 | 0 | 1 | 9 | HT | TCT | EM | SPD | ) | | 9 | | I | | Y | | i | | y | |
| 1 | 0 | 1 | 0 | A | LF | | SUB | | * | | : | | J | | Z | | j | | z | |
| 1 | 0 | 1 | 1 | B | VT | | ESC | | + | | ; | | K | | [ | | k | | { | |
| 1 | 1 | 0 | 0 | C | FF | | FS | | , | | < | | L | | \ | | l | | \| | |
| 1 | 1 | 0 | 1 | D | CR | | GS | | - | | = | | M | | ] | | m | | } | |
| 1 | 1 | 1 | 0 | E | SO | | RS | | . | | > | | N | | ^ | | n | | ~ | |
| 1 | 1 | 1 | 1 | F | SI | | US | | / | | ? | UNL | O | | _ | UNT | o | | DEL | |

Address Command Group (ACG)

Universal Command Group (UCG)

Listen Address Group (LAG)

Talk Address Group (TAG)

Primary Command Group (PCG)

Secondary Command Group (SCG)

Notes:
1 MSG=INTERFACE MESSAGE (Sent by ATN of True, Low level)
2 b1=DI01...b7=DI07 (b1 through b7 correspond to DI01 to DI07 sequence.)GTL

| | |
|---|---|
| SDC | Go to Local |
| PPC | Select Device Clear |
| GET | Parallel Poll Configure |
| TCT | Group Execute Trigger |
| LLO | Take Control |
| DCL | Local Lockout |
| PPU | Device Clear |
| SPE | Parallel Poll Unconfigure |
| SPD | Serial Poll Enable |
| UNL | Serial Poll Disable |
| UNT | Unlisten |
| (ACG) | Untalk |
| (UCG) | Addressed Command Group |
| (LAG) | Universal Command Group |
| (TAG) | Listen Address Group |
| (PCG) | Talk Address Group |
| (SCG) | Primary Command Group |
| | Secondary Command Group |

## Table A-2 Interface Message Groups

| D 1 0 8 | D 1 0 7 | D 1 0 6 | D 1 0 5 | D 1 0 4 | D 1 0 3 | D 1 0 2 | D 1 0 1 | Interface message group (G) |
|---|---|---|---|---|---|---|---|---|
| × | 0 | 0 | 0 | b4 | b3 | b2 | b1 | Addressed command G |
| × | 0 | 0 | 1 | b4 | b3 | b2 | b1 | Universal command G |
| × | 0 | 1 | b5 | b4 | b3 | b2 | b1 | Listen address G |
| × | 0 | 1 | 1 | 1 | 1 | 1 | 1 | Unlisten (UNL) |
| × | 1 | 0 | b5 | b4 | b3 | b2 | b1 | Talker Address G |
| × | 1 | 0 | 1 | 1 | 1 | 1 | 1 | Untalk (UNT) |
| × | 1 | 1 | b5 | b4 | b3 | b2 | b1 | Secondary command G |

## Table A-3 Address Assignments

| Address character | | Address swich setting | | | | | Primary address | Factory address set device |
|---|---|---|---|---|---|---|---|---|
| Talk | Listen | 5 | 4 | 3 | 2 | 1 | | |
| $b_7$ $b_6$ | $b_7$ $b_6$ | $b_5$ | $b_4$ | $b_3$ | $b_2$ | $b_1$ | | |
| 1 0 | 0 1 | ↓ | ↓ | ↓ | ↓ | ↓ | Decimal | |
| @ | SP | 0 | 0 | 0 | 0 | 0 | 0 | |
| A | ! | 0 | 1 | 0 | 0 | 1 | 1 | |
| B | " | 0 | 0 | 0 | 1 | 0 | 2 | |
| C | # | 0 | 0 | 0 | 1 | 1 | 3 | |
| D | $ | 0 | 0 | 1 | 0 | 0 | 4 | |
| E | % | 0 | 0 | 1 | 0 | 1 | 5 | |
| F | & | 0 | 0 | 1 | 1 | 0 | 6 | |
| G | ' | 0 | 0 | 1 | 1 | 1 | 7 | |
| H | ( | 0 | 1 | 0 | 0 | 0 | 8 | |
| I | ) | 0 | 1 | 0 | 0 | 1 | 9 | |
| J | * | 0 | 1 | 0 | 1 | 0 | 10 | |
| K | + | 0 | 1 | 0 | 1 | 1 | 11 | |
| L | , | 0 | 1 | 1 | 0 | 0 | 12 | |
| M | - | 0 | 1 | 1 | 0 | 1 | 13 | Printer Plotter |
| N | . | 0 | 1 | 1 | 1 | 0 | 14 | |
| O | / | 0 | 1 | 1 | 1 | 1 | 15 | |
| P | 0 | 1 | 0 | 0 | 0 | 0 | 16 | |
| Q | 1 | 1 | 0 | 0 | 0 | 1 | 17 | |
| R | 2 | 1 | 0 | 0 | 1 | 0 | 18 | |
| S | 3 | 1 | 0 | 0 | 1 | 1 | 19 | |
| T | 4 | 1 | 0 | 1 | 0 | 0 | 20 | |
| U | 5 | 1 | 0 | 1 | 0 | 1 | 21 | |
| V | 6 | 1 | 0 | 1 | 1 | 0 | 22 | |
| W | 7 | 1 | 0 | 1 | 1 | 1 | 23 | |
| X | 8 | 1 | 1 | 0 | 0 | 0 | 24 | |
| Y | 9 | 1 | 1 | 0 | 0 | 1 | 25 | |
| Z | : | 1 | 1 | 0 | 1 | 0 | 26 | |
| [ | ; | 1 | 1 | 0 | 1 | 1 | 27 | |
| \ | < | 1 | 1 | 1 | 0 | 0 | 28 | |
| ] | = | 1 | 1 | 1 | 0 | 1 | 29 | |
| ^ | > | 1 | 1 | 1 | 1 | 0 | 30 | |
| ? | — | 1 | 1 | 1 | 1 | 1 | 31 | UNL,UNT |

# APPENDIX B COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

| Function | Controller | | | |
|---|---|---|---|---|
| | PACKET V (Anritsu) | PC-9800 series (NEC) | IBM-PC | HP9000 series |
| Outputs data to a device | WRITE<br>@ device number; data | PRINT<br>@ listener address; data | CALL<br>IBWRT( ) | OUTPUT device selector;data |
| Outputs binary data to a device | BIN WRITE<br>@ device number; data | WBYTE command;data | | |
| Assigns data entered from a device to a variable | READ<br>@ device number:variable | INPUT @ talker address, listener address;variable LINE INPUT @ talker address, listener address;variable | CALL<br>IBRD( ) | ENTER device selector;variable |
| Assigns binary data entered from a device to a variable | BIN READ<br>@ device number; variable | RBYTE command;variable | | |
| Initializes an interface function | IFC @ select code | ISET IFC | CALL<br>IBSIC( ) | ABORT<br>select code |
| Turns REN line on | REN @ select code | ISET REN | CALL<br>IBSRE( ) | REMOTE<br>device selector<br>(select code) |
| Turns REN line off | LCL @ select code<br>(sets all devices local)<br>LCL @ device number<br>(sets only specified devices to listeners, and sends out GTL command) | IRESET REN<br><br>WBYTE &H3F,listener address,secondary address,&H01; | CALL<br>IBSRE( )<br><br>CALL<br>IBLOC( ) | LOCAL<br>device selector<br>(select code)<br>LOCAL<br>device selector<br>(select code<br>+ primary address) |
| Outputs interface messages (messages) and data | COMMAND<br>@ select code<br>: character string for message [;data] | | CALL<br>IBCMD()<br>CALL<br>IBCMDA()<br>(asynchronous) | SEND<br>select code<br>;message string |
| Triggers a specified device | TRG @ device number | WBYTE &H3F,listener address,secondary address,&H08; | CALL<br>IBTRG( ) | TRIGGER<br>device selector |

| Function | Controller | | | |
|---|---|---|---|---|
| | PACKET V (Anritsu) | PC-9800 series (NEC) | IBM-PC | HP9000 series |
| Initializes devices | DCL @ select code<br>(all devices bearing a specified select code)<br>DCL @ device number<br>(specified devices only) | WBYTE &H3F,&H14;<br><br>WBYTE &H3F,<br>listener address,<br>secondary address,&H04; | CALL<br>IBCLR( ) | CLEAR<br>device selector<br>(selector code)<br>CLEAR<br>device selector<br>(selector code +<br>primary address) |
| Disables a device from being switched over from remote to local | LLO @ select code | WBYTE &H3F, &H11; | | LOCAL<br>LOCKOUT |
| Transfers control to a specified device | RCT @ device number | WBYTE talker address,<br>&H09; | CALL<br>IBPCT( ) | PASS CONTROL |
| Sends out a service request | SRQ @ select code | ISET SRQ | CALL<br>IBRSV( ) | REQUEST<br>select code |
| Performs serial polling | STATUS<br>@ device number | POLL | CALL<br>IBRSP( ) | SPOLL<br>(device selector)<br>(function) |
| Sets a terminator code | TERM IS | CMD DELIM | CALL<br>IBEOS( )<br>CALL<br>IBEOT( ) | |
| Sets a limit value for checking a timeout | | CMD TIMEOUT | CALL<br>IBTOM( ) | |

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